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THE

JOURNAL

OF THE

BOMBAY NATURAL HISTORY SOCIETY.

590.5, B63J
79690

EDITED BY

P. M. D. SANDERSON, F.Z.S., S. H. PRATER, M.L.C., C.M.Z.S.,
AND C. McCANN, F.L.S.

CHECKED 19
Initial

VOL. XXXVIII, No. 1

Date of Publication, 15th August, 1935.

Price to Non-Members ... ... *Rs. 15-0-0*
or £ 1-3-0.

For terms of membership, see inside front cover.

Honorary Secretary's Address:
BOMBAY NATURAL HISTORY SOCIETY,
6, Apollo Street, Bombay.

LONDON AGENTS:
DULAU & Co., Ltd.,
2, Stafford Street,
Old Bond Street, W. 1.

PRINTED AT THE DIOCESAN PRESS, MADRAS.

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CONTENTS OF VOLUME XXXVIII, No. 1.

PAGE

THE GAME BIRDS OF THE INDIAN EMPIRE. By E. C. Stuart Baker, C.I.E., O.B.E., F.Z.S., F.L.S., M.B.O.U., H.F.A.O.U. Vol. V. Part XXII. (*With a coloured plate*) 1

REVISION OF THE FLORA OF THE BOMBAY PRESIDENCY. By the late Rev. E. Blatter, S.J., Ph.D., F.L.S. Part XXVII. 6

A GAME SANCTUARY IN CEYLON. By Lt.-Col. R. W. Burton, Indian Army (retired). (*With one black and white plate*) 19

THE VERNAY SCIENTIFIC SURVEY OF THE EASTERN GHATS. (Ornithological Section). By H. Whistler, M.B.O.U., Assisted by N. B. Kinnear, M.B.O.U. Part XI. 26

THE PAPAW TREE. By J. F. Caius, S.J., F.L.S. 41

THE ORNITHOLOGY OF TRAVANCORE AND COCHIN. By Sālim Ali. With Notes by H. Whistler. Part II. (*With two plates*) 61

SOME BEAUTIFUL INDIAN TREES. By the late Rev. E. Blatter, S.J., Ph.D., F.L.S., and W. S. Millard, F.Z.S. Part XVIII. (*With one coloured plate and two text-figures*) 93

A LIST OF THE BIRDS OF THE CENTRAL PROVINCES. By E. A. D'Abreu, F.Z.S. 95

THE FLOWERING OF *Strobilanthes* IN 1934. By. M. E. Robinson. (*With eight plates*) 117

THE INDIAN CADDIS-FLIES (*Trichoptera*). By Martin E. Mosely, F.B.E.S. Part III. (*With thirteen plates*) 123

A DESCRIPTION OF THE NOTODONTID MOTH *Dudusa nobilis* WALKER, AND ITS EARLY STAGES. By. T. R. Bell, I.F.S. (Retired). (*With two plates*) 134

RHINOCEROS SHOOTING IN BURMA. By W. S. Thom. (*With one plate*). 137

AN ACCOUNT OF THE OCCURRENCE OF *Chrysomphalus aurantii*, MASK AND *Laccifer lacca*, KERR ON GRAPE FRUIT IN RANCHI DISTRICT, CHOTA NAGPUR, WITH A NOTE ON THE CHALCIDOID PARASITES OF *Aspidiotus orientalis*, NEWST. By P. M. Glover, B.SC. (*With a plate*). 151

NOTES ON THE SYSTEMATIC POSITION OF *Sansevieria* GROWING IN INDIA WITH SPECIAL REFERENCE TO *S. Laurentii* WILDEMAN. By K. Biswas. 154

SOME BIRDS OF CHITTAGONG. By Major R. S. P. Bates, M.B.O.U. ... 158

THE MEDICINAL AND POISONOUS SEDGES OF INDIA. By J. F. CAIUS, S.J., F.L.S. 163

REVIEWS—

I.—Popular Handbook of Indian Birds..... 171
II.—Tiger und Mensch 171
III.—Zur Kenntnis Nordostasiatischer Vögel. 174
IV.—Lac and Indian Lac Research Institute 175
V.—The Fauna of British India (Reptiles and Amphibians) 175

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Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

MISCELLANEOUS NOTES :—

I.—A Note on the Discovery of *Pipistrellus mordax* (Peters), the Grizzled Bat in Ceylon. By W. A. A. Phillips 177

II.—Tigers in the Sunderbans. By T. V. Dent., I.F.S. 178

III.—Tiger killing solitary Bull Bison (*Bibos gaurus*). By R. C. Morris, F.Z.S., F.R.G.S. 179

IV.—Tigers burying their Kill. By T. R. Livesey. 179

V.—How Tigers kill their Prey. By T. R. Livesey. 180

VI.—Note on the Record Indian Lion. By P. R. Cadell. 181

VII.—Anti-rabic Treatment of an Indian Lion. By P. R. Cadell. 181

VIII.—Abnormal Dental growth in a Rat. By R. L. Soni, M.B , B.S. 181

IX.—Birth of an Elephant Calf (*Elephas maximus*). By A. C. Tutein-Nolthenius. 183

X.—Growth and Shedding of Antlers of Sambur and Swamp Deer in Assam. By Viscount Ed. De Poncins. 185

XI.—Some little-known Birds of Northern Burma. By J. K. Stanford. 185

XII.—Mating Habits of Mynahs and Crows. By K I. Varghese, M.A. 186

XIII.—Nidification of the Shan States Bar-Wing (*Actinodura r. ramsayi* (Walden)). By T. R. Livesey. 187

XIV.—Nidification of the Black-headed Babbler (*Rhopocichla a. atriceps* (Oates). By F. N. Betts. 189

XV.—On the Occurrence of the Tibetan Siskin (*Spinus thibetanus*) in Northern Burma. By J. K. Stanford, I.C.S. 189

XVI.—Vultures Feeding at Night. By R. C. Morris. 190

XVII.—Peregrine and Spur-winged Plover. By T. R. Livesey. 190

XVIII.—Distribution of the Indian Hoopoe (*Upupa epops orientalis* Stuart Baker). By W. H. Matthews. 191

XIX.—The Lesser Florican (*Sypheotides indica* Miller) in the Konkan. By S. H. Prater..... 191

XX.—Some Notes on Woodcock (*Scolopax r. rusticola* Linn.) in Burma. By. J. K. Stanford, I.C.S. 192

XXI.—Albino Fan-tail Snipe (*Capella g. gallinago* Linn.) By H. C. M. Dunn, LT., R.A. 193

XXII.—A Second Record of the Occurrence of the Long-tailed Duck (*Clangula hyemalis*) in India. By R. E. Parsons. 193

XXIII.—The Occurrence of the Scaup (*Nyroca marila* Linn.) in the Bhavnagar State. By K. S. Dharma Kumarsinhji. 195

XXIV.—The Bronze-capped Teal (*Eunetta fulcata* Georgi) in the Samastipur District, Bengal. By C. I. Parr. 195

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PAGE

XXV.—Occurrence of the Marbled Duck (*Marmaronetta angustirostris* Ménétriés) near Poona. By F. C. Hickie, Lt.-Col. ... 196

XXVI.—The Sheldrake (*Sarkidiornis melanotus* Penn.) and the Comb Duck (*Tadorna tadorna* Linn.) in Sind. By C. B. Rubie, Lt.-Col. 196

XXVII.—Arrival Dates of Migrant Birds in Coorg. By F. N. Betts.... 197

XXVIII.—An Addition to List of Snakes of Bombay and Salsette: *Coronella brachyura*. By H. Ali. 197

XXIX.—A Further List of Snakes from Ahmednagar. By K. G. Gharpurey, Lt.-Col., I.M.S. 198

XXX.—Mating of the Hamadryad or King Cobra (*Naia bungarus* Schleg.). By W. J. L. Smith. 200

XXXI.—Occurrence of *Dipsadomorphus multimaculata* Schleg. in Assam. By S. H. Prater, C.M.Z.S. 201

XXXII.—The Common Chamaeleon (*Chamaeleon zeylanicus* Laurenti) in Gujarat. By A. T. Barry. 201

XXXIII.—Rate of Growth of the Mugger (*Crocodilus palustris* Lesson). By E.A. D'Abreu, F.Z.S. 202

XXXIV.—Butterflies of Lahore. By D. R. Puri 202

XXXV.—Mimicry: Being Notes on certain Indian Butterflies. By D. G. Sevastopulo, F.R.E.S. 203

XXXVI.—A Preliminary List of the *Pyralidae* of Calcutta. By D. G. Sevastopulo, F.R.E.S. 204

XXXVII.—A Note on *Elymnias hypermnestra undularis* Drury. By D. G. Sevastopulo, F.R.E.S. 206

XXXVIII.—Wax-production in Mealy Bugs: *Aleurodidae*. By V. G. Deshpande, M.Ag., Ph.D. 206

XXXIX.—An Annotated List of Indo-Ceylonese Termites. By V. Margabandhu. 208

XL.—A Note on the Distribution, Oviposition and Parental Care of *Scutigerella unguiculata* Hansen var. *indica* Gravely. By S. Jones. 209

XLI.—Observations on the Oviposition and Development of a species of *Polyxenus*. By S. Jones. 211

XLII.—Precocious Germination. By N. K. Tiwary. 213

XLIII.—Root Formation from Leaf-cuttings. By N. K. Tiwary. ... 216

Proceedings of the Annual Meeting. 219

CC-0. In Public Domain. Gurukul Kangri Collection, Haridwar

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CONTENTS OF VOLUME XXXVIII, No. 2.

PAGE

SOME BEAUTIFUL INDIAN TREES. By the late Rev. E. Blatter, S.J., PH.D., F.L.S., and W. S. Millard, F.Z.S. Part XIX. (*With two coloured plates, one black-and-white plate and two text-figures*). ... 229

THE VERNAY SCIENTIFIC SURVEY OF THE EASTERN GHATS. (Ornithological Section). By H. Whistler, M.B.O.U., assisted by N. B. Kinnear, M.B.O.U. Part XII. ... 232

EARLY DAYS IN MALAVA. By H. E. Burgess. ... 241

SOME BUTTERFLIES OF NEPAL. By Major W. G. H. Gough, 2nd K. E. O. Gurkha Rifles. ... 258

CUCKOO-LORE. By Lieut.-Col. R. W. Burton, Indian Army (*Retired*). 266

THE ORNITHOLOGY OF TRAVANCORE AND COCHIN. By Sālim Ali. With Notes by H. Whistler. Part III. (*With two plates*). ... 282

FEEDING OF COBRAS IN CAPTIVITY. By Dr. S. G. Tscherbakoff. (*From the Haffkine Institute, Bombay*). ... 321

THE BUTTERFLIES OF THE NILGIRI DISTRICT. By J. A. Yates. ... 330

THE MEDICINAL AND POISONOUS FERNS OF INDIA. By J. F. Caius, S.J., F.L.S. ... 341

EARTH-EATING AND SALT-LICKING IN INDIA. By J. F. Caius, S.J., F.L.S., and S. K. Chhapgar, B. Sc., (*St. Xavier's College, Bombay*). ... 362

REVIEWS :—

I.—The Birds of Nippon, Vol. I, Part 5. ... 378

II.—Natural History of Central Asia, Vol. X. 'The Reptiles of China.' ... 378

III.—Auf Stillen Pfaden (Guja). ... 379

IV.—A Flower Book for the Pocket. ... 380

MISCELLANEOUS NOTES :—

I.—The Lion in Baluchistan. By R. I. Pocock, F.R.S. ... 381

II.—A Pair of Indian Lions presented to the British Museum by H. H. The Nawab of Junagadh. By R. I. Pocock, F.R.S. 382

III.—A Short-tailed Tiger. By The Maharaja of Surguja. ... 384

IV.—A Case of Tiger Eating Salt-Lick Earth. By R. C. Morris. 385

V.—Tiger Feeding on a Live Cow. By R. C. Morris. ... 386

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PAGE

VI.—Distribution of the Hunting Leopard (*Acinonyx jubatus* Erxl.) in South India. By R. C. Morris. 386

VII.—A Fight betweena Cat and a Viper. By T. V. Subrahmanyam. 387

VIII.—Bandicoots attacking a Cobra. By S. C. Petit. 388

IX.—Behaviour of the Wild Dog (*Cuon dukhunensis* Sykes). By T. R. Livesey. 388

X.—Ratels and Corpses. By L. E. Clifford Hurst. 390

XI.—Sloth Bear (*Melursus ursinus* Shaw) Attacking a Live Bait. By The Maharaja of Surguja. 391

XII.—Age of Puberty in the Indian Elephant (*Elephas maximus*). By A. E. Foot. 392

XIII.—Social Behaviour of Bison (*Bibos gaurus* H. Sm.). By R. C. Morris. 393

XIV.—The White Bison (*Bibos gaurus* H. Sm.) of South Coimbatore. By R. C. Morris. 393

XV.—Length of Horns in Tsine (*Bibos banteng birmanicus* Lyd.). By D. A. De Lastic. 394

XVI.—Habits of the Hog Deer (*Hyelaphus porcinus* Zimm.). By J. B. Rowntree, I.F.S. 396

XVII.—Distribution of Chital (*Axis axis* Erxl.) in Assam. By R. N. De, I.F.S. 396

XVIII.—The Status of the Brown Shrike (*Lanius c. cristatus* Linn.) in the S. S. States, Burma. By T. R. Livesey 397

XIX.—Habits of the Burmese Stone Chat (*Saxicola caprata burmanica* Stuart Baker). By T. R. Livesey. 398

XX.—Cuckoos in the S. Shan States. By T. R. Livesey. 401

XXI.—Speed of the Golden Oriole (*Oriolus o. kundoo* Sykes). By H N. Acharya. 403

XXII.—On the Occurrence of the Ibis-bill (*Ibidorhyncha struthersii* Gould) in Upper Burma. By. J. K. Stanford, I.C.S, ... 403

XXIII.—Occurrence of the Flamingo (*Phoenicopterus ruber antiquorum* Temm.) in North Gujarat. By H. N. Acharya, F.Z.S., F.R.G.S. 404

XXIV.—Some Rare Birds in Northern Burma. By J. K. Stanford, I.C.S. 404

XXV.—Notes on Some Birds observed between Yatung and Gyantse, Tibet. By Capt. R. K. M. Battye. 406

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PAGE

XXVI.—A large Mugger (*Crocodilus palustris* Lesson) from Bikane —A Correction. By The Secretary to Heir-Apparent of Bikaner. 408

XXVII.—The Mugger (*Crocodilus palustris* Lesson) Feeding on Large Water-Beetles (*Cybister sp.*). By C. McCann. 409

XXVIII.—Male Rat-Snakes (*Zamenis mucosus* Boulenger) Fighting. By C. McCann. 409

XXIX.—Precocity in Young Bull-Frogs (*Rana tigrina* Daud). By C. McCann. 409

XXX.—Ants Attacking Rubber Goods. By R. N. Champion-Jones. 410

XXXI.—Occurrence of the Beetle *Sternocera chrysis* in Waziristan. By Capt. D. G. Lowndes. 411

XXXII.—Parental Care in Scorpions. By E. Ernest Green. 411

XXXIII.—Abnormal Flowers of the Radish (*Raphanus sativus* Linn). By Agha Mohammad. 412

Proceedings. 414

Supplement.—The Wild Animals of the Indian Empire and the Problem of their Preservation. Part IV.

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CONTENTS OF VOLUME XXXVIII, No. 3.

PAGE

SOME BEAUTIFUL INDIAN TREES. By the late Rev. E. Blatter, S.J., PH.D., F.L.S., and W. S. Millard, F.Z.S. Part XX. (*With two coloured plates, and four black-and-white plates*)..... 415

THE VERNAY SCIENTIFIC SURVEY OF THE EASTERN GHATS. (Ornithological Section). By H. Whistler, M.B.O.U., assisted by N. B. Kinnear, M.B.O.U. Part XIII..... 418

TO MALAYA FOR A RHINOCEROS. By R. C. Morris. (*With two plates*)... 438

THE INDIAN CADDIS-FLIES (*Trichoptera*). By Martin E. Mosely, F.R.E.S. Part IV. (*With 16 text-figures and 18 plates*)..... 447

THE MALAY TAPIR (*Tapirus indicus*). By W. S. Thom. (*With one plate*)..... 479

THE ORNITHOLOGY OF TRAVANCORE AND COCHIN. By Salim Ali. With Notes by H. Whistler. Part IV..... 484

HOG-HUNTING REMINISCENCES. By J. C. A..... 515

ON THE BIRDS OF THE KISHENGANGA VALLEY, KASHMIR. By Major R. S. P. Bates, M.B.O.U. (*With four plates*)..... 520

THE MEDICINAL AND POISONOUS GRASSES OF INDIA. By J. F. Caius, S.J., F.L.S..... 540

SHOOTING WILD BUFFALO IN THE KOSI RIVER SWAMPS. By J. E. Hall. (*With one plate*)..... 585

THE LIFE HISTORY FROM EGG TO PUPA OF *Brahmea Wallichii* GRAY. By Major J. A. Graham, R. E. (*With two plates and four text-figures*)..... 593

A FISHING TRIP IN KUMAON. By A. St. J. Macdonald. (*With two plates*)..... 598

ON THE OCCURRENCE OF ADHESIVE TENDRILS IN *Bignonia venusta* KER-GAWL. By J. F. R. D'Almeida, B.A., M.SC. (*With one plate*)..... 601

REVIEWS :—

I.—An Abridged Catalogue of certain *Scutelleroidea* of China, Chosen, Indo-China, and Taiwan..... 604

II.—The Snakes of India..... 604

III.—The Nidification of Birds of the Indian Empire. Vol. IV. 605

OBITUARIES :—

Mr. Osmond Charles Ollenbach..... 607

Mr. Walter Ormiston..... 608

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Digitized by Arya Samaj Foundation Chennai and eGangotri

PAGE

MISCELLANEOUS NOTES :—

I.—Tiger *versus* Bison. By R. C. Morris..... 609

II.—Occurrence of the Panther (*Panthera pardus* Linn.) in Tibet. By Capt. R. K. M. Battye..... 609

III.—Further Records of the Distribution of the Cheetah (*Acinonyx jubatus* Erxl.) in South India. By R. C. Morris..... 610

IV.—Description of a Blue Bear (*Ursus arctos pruinosus* Blyth) from Tibet. By S. H. Prater..... 610

V.—Ratels and Corpses. By A. A. Dunbar Brander, I.F.S. (Retd.)..... 611

VI.—Ratels and Corpses. By Lt.-Col. C. G. Toogood, D.S.O..... 612

VII.—The Birth of an Elephant Calf. By R. C Morris..... 613

VIII.—Why Elephants turn 'Rogues'. By S. K. Ghosh, I.C.S..... 614

IX.—The Formation and Absence of Tusks in Elephants. By R. C. Morris..... 615

X.—Horn Growth as observed in Black-buck and Nilgai. By J. E. Hall..... 618

XI.—Early Development of Antlers by Sambhur in the Billigiri-rangan Hills, South India. By R. C. Morris..... 619

XII.—White Bison. By A. A. Dunbar Brander, I.F.S. (Retd.)..... 619

XIII.—Mating Habits of Crows. By Narayan Rao Babasaheb, Chief of Ichalkaranji..... 620

XIV.—Extension of the Range of the White-Browed Bulbul (*Pycnonotus luteolus* Less.). By S. C. Law, M.A., Ph.D., F.Z.S., M.B.O.U..... 620

XV.—Further Report on the Nesting of *Geocichla c. citrina* Lath. In 24-Parganas (Bengal). By S. C. Law, M.A., Ph.D., F.Z.S., M.B.O.U..... 622

XVI.—The Distribution of the Kashmir Roller (*Coracias garrula semenowi*). By H. Abdul Ali..... 622

XVII.—Habits of the Plaintive Cuckoo (*Cacomantis merulinus* Scop). By Lt.-Col. G. Covell, I.M.S..... 623

XVIII.—The Short-eared Owl (*Asio flammeus* Pontopp.) out at Sea. By C. McCann..... 623

XIX.—Vultures Feeding at Night. By W. Gough..... 624

XX.—Probable Breeding of the Black-winged Stilt (*Himantopus h. himantopus*) in the Shwebo District, Upper Burma. By J. K. Stanford, I.C.S..... 624

XXI.—The Jack Snipe and the White-eyed Pochard in Hyderabad. By H. Abdul Ali..... 625

XXII.—Some Rare Birds in Northern Burma. By J. K. Stanford, I.C.S..... 625

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PAGE

XXIII.—Notes on Elwes' Horned Pheasant (*Crossoptilon harmani* Elwes). By Capt. R. K. M. Battye 626

XXIV.—Migration of Wild Fowl. By Editors..... 627

XXV.—Do Birds employ Ants to rid themselves of Ectoparasites? By Salim Ali..... 628

XXVI.—Geckos and Superstition. By B. C. Mahendra..... 631

XXVII.—The Notodontid Moth *Dudusa nobilis* Walker. By Capt. W. C. Carrott..... 633

XXVIII.—Occurrence of *Unkana attina* in the Teesta Valley. By Lieut. John Eliot, R.A..... 633

XXIX.—On the Preservation of *Heterocera* in India. By D. G. Sevastopulo, F.R.E.S..... 634

XXX.—On the Flowering of *Strobilanthes* in 1934. By P. V. Mayuranathan..... 636

PROCEEDINGS :—..... 637

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CONTENTS OF VOLUME XXXVIII, No. 4.

PAGE

THE VERNAY-HOPWOOD UPPER CHINDWIN EXPEDITION. By R. C. Morris, F.Z.S., F.R.G.S. (*With 6 Black and White Plates*)... 647

THE VERNAY SCIENTIFIC SURVEY OF THE EASTERN GHATS. Part XIV. By H. Whistler, M.B.O.U., assisted by N. B. Kinnear, M.B.O.U..... 672

A NEW RACE OF HORSFIELD'S SCIMITAR-BABBLER. By H. Whistler, F.Z.S., M.B.O.U..... 699

NEW ORIENTAL DRAGONFLIES. By Lt.-Col. F. C. Fraser, I.M.S. (Retd.)..... 700

FRESHWATER FISH AND FISHERIES OF TRAVANCORE. By C. C. John, M.A., D.Sc. (Lond.), D.I.C. (*With 5 text figures*)..... 702

CUCKOO PROBLEMS. By T. R. Livesey. (*With 4 plates*)..... 734

THE ORNITHOLOGY OF TRAVANCORE AND COCHIN. By Salim Ali, with notes by H. Whistler, F.Z.S., M.B.O.U. Part V..... 759

THE MEDICINAL AND POISONOUS ORCHIDS OF INDIA. By Rev. J. F. Caius, S.J., F.L.S..... 791

BUTTERFLIES OF SECUNDERABAD. By D. F. Sanders..... 800

A DESCRIPTION OF A NEW SPECIES OF WASP ASSUMED TO BELONG TO THE FAMILY VESPIDÆ AND NAMED *Paravespa eva*; WITH REMARKS UPON ITS AFFINITIES WITH THE GENUS *Ischnogaster* AND REASONS FOR THE CREATION OF THE NEW GENUS *Paravespa*. By T. R. Bell, C.I.E. (Retd.). (*With a plate*)..... 803

REVIEWS :—

I.—Man : A special creation..... 807

II.—Glimpses of the Wild..... 808

III.—A Shellac Patent Index..... 808

IV.—Wild Animals of the Indian Empire and the Problem of their preservation..... 808

AN APPEAL : Wanted information about Cuckoos. By E. Stuart Baker. 810

MISCELLANEOUS NOTES :—

I.—Roosts of Flying Fox. By H. G. Acharya, F.Z.S., F.R.G.S. 812

II.—Melanism in Wild Dogs. By R. C. Morris, F.Z.S., F.R.G.S. 813

III.—Legendary method of hunting in Wild Dogs. By Lt.-Col. Arundel Begbie..... 814

IV.—Sound listening for Tiger shooting. By Lt.-Col. J. Toogood..... 814

V.—Measurements of a Buffalo head from Assam. By R. G. Griffith. (*With a photo*)..... 817

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CONTENTS OF Vol. XXXVIII, No. 4

PAGE

VI.—Bison and Panther. By R. C. Morris, F.Z.S., F.R.G.S..... 818

VII.—Gaur-Heads from the Chin Hills. By T. R. Livesey..... 819

VIII.—Season of horn development in Sambhur. By R. C. Morris, F.Z.S., F.R.G.S..... 819

IX.—Cuckoo-Lore. By Rev. F. C. R. Jourdain and T. R. Livesey..... 820

X.—The Brown Shrike (*Lanius cristatus* Linn.) in Burma and Assam. By Dr. C. B. Ticehurst..... 824

XI.—A Note on the distribution of *Chloropsis jerdoni* (Blyth) and *Chloropsis a. aurifrons* (Temm.) in Central and Western Bengal. By S. C. Law..... 825

XII.—Indus Sand Lark (*Alaudula raytal adamsi* Hume) and Crested Lark (*Galerida cristata*, Linn.) laying in the same nest. By H. M. S. Newton..... 826

XIII.—The Brown Wood Owl (*Strix indranee*, Sykes.). By T. R. Livesey. (*With a photo*)..... 827

XIV.—The White-Bellied Sea-Eagle (*Haliaëtus leucogaster* Gmelin) By H. N. G. Acharya..... 828

XV.—The Eyesight of Vultures. By A. A. Dunbar Brander..... 828

XVI.—A note on the Alpine Swifts (*Micropus melba bakeri* Hartert at Gersoppa. By Humayun Abdulai..... 829

XVII.—Does the Japanese Grey Quail (*Coturnix c. japonica*) breed in the Shan States? By T. R. Livesey..... 830

XVIII.—Sarus Flocks. By H. N. G. Acharya..... 831

XIX.—The Long-tailed Duck (*Clangula hyemalis* Linn.) in Sind.... 831

XX.—Death of Survey Khalassi due to poisoning by Common Krait (*Bungarus cæruleus*). By Eds..... 832

XXI.—Migration of Wild Fowl. By Eds..... 833

XXII.—Occurrence of Shrenk's Bittern (*Ixobrychus eurythmus*, Swinhoe) in Amherst District, Tenasserim. By C. E. Milner, I.F.S..... 834

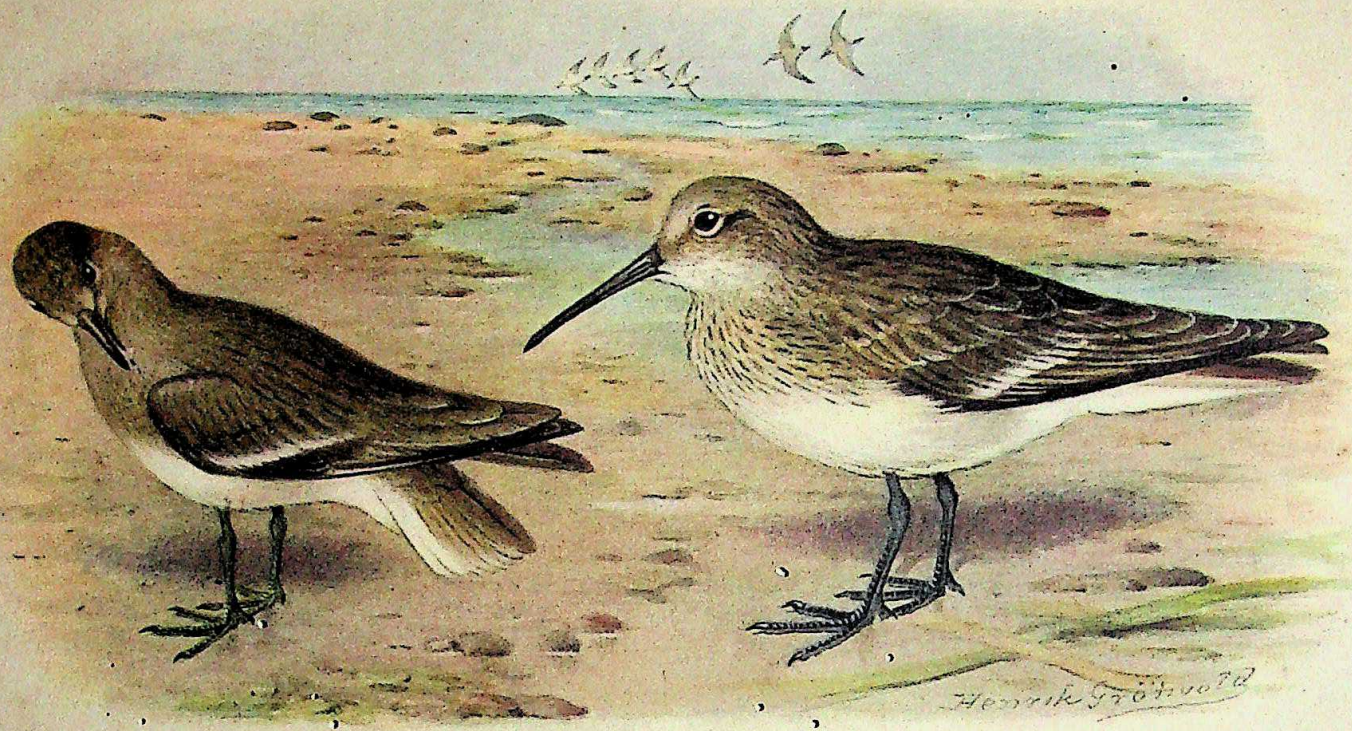
XXIII.—Occurrence of the Butterfly (*P. antiphates naira*) in the Nilgiris. By Brig. T. D. Broughton, R.E. (Retd.)..... 834

XXIV.—Distribution of the Buprestid Beetle (*Sternocera chrysis* F.) By C. F. C. Beeson..... 834

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TEMMINCKS STINT 3/5.
Erolia temminckii.

THE DUNLIN 3/5.
Erolia alpina alpina.

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पुस्तकालय
गुरुकुल कांगड़ी विश्वविद्यालय
हरिद्वार

JOURNAL
OF THE
Bombay Natural History Society.

AUGUST, 1935. VOL. XXXVIII. No. 1.

THE GAME BIRDS OF THE INDIAN EMPIRE.

BY

E. C. STUART BAKER, C.I.E., O.B.E., F.Z.S., F.L.S., M.B.O.U., H.F.A.O.U.

VOL. V.

THE WADERS AND OTHER SEMI-SPORTING BIRDS.

PART XXII.

(*With a coloured plate*).

(*Continued from page* 254 *of volume* xxxvii).

EROLIA ALPINA ALPINA.

The Dunlin.

Tringa alpina Linn., Syst. Nat., 10th ed., vol. i, p. 149 (1758) (Lapland).

Erolia alpina alpina Fauna B.I., Birds, vol. vi, p. 241 (1929).

Description.—Breeding plumage. A narrow line next the bill and a faintly indicated supercilium white, streaked with black; upper plumage bright deep rufous, each feather broadly centred black and some of the longer scapulars and innermost secondaries terminally edged with white; hind-neck greyish-white streaked with black; lower back and rump dark grey-brown, showing little rufous or black; sides of rump and lateral tail-coverts white; central tail-feathers blackish-brown, the lateral grey with white edges; wing-coverts grey-brown with darker centres and pale or whitish edges; the greater coverts with broader white edges; primary coverts and primaries blackish, the former narrowly edged whitish, the latter white-shafted, but the bases and tips of the shafts of the second and third primaries brownish; outer secondaries nearly all white with dark centres; sides of head, chin, throat and upper breast white streaked with blackish, often suffused with rufous, especially on the chin and fore-neck; centre of breast and abdomen blackish-brown; flanks, axillaries and under tail-coverts white, the last streaked with black.

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Colours of soft parts.—Iris hazel or dark brown; bill and legs black.

Measurements.—Wing 104 to 120 mm.; tail 46 to 51 mm.; tarsus about 21 to 26 mm.; culmen 25 to 31 mm.

In Winter.—Upper plumage ashy-grey, the feathers of the head with darker brown streaks, the remainder with dark shaft-stripes only; innermost secondaries darker and browner with narrow whitish or rufescent-white edges; lores, sides of the head, neck and fore-neck fulvescent-grey with dark brown streaks, remainder of lower plumage white.

Young Birds have the upper plumage like the adult in breeding plumage but are much less richly rufous and have more white edges to the feathers of the mantle, the fore-neck is dull pale rufous and the underparts are white, more or less spotted with brown.

Young in down.—Centre of crown and centre of back deep chestnut surrounded by black; a black line through the eye becoming chestnut posteriorly; a narrow line on the wings black; a black patch on each side of the eupopygium and a line across joining the black round the centre of the back, the down ending in little whitish tufts; rest of upper surface rich rufous-buff; below whitish-buff, the chin, throat and breast darker.

Distribution.—Europe, from Lapland to Eastern Russia, but replaced in the south during the breeding season by *E. a. schinzii.* (Northern Asia). In India, it is common during the winter in Sind and the north-west, extending as far south as the Deccan and east to Nepal, Eastern Bengal and Assam, though it is rare east of the United Provinces. All our specimens from India appear to be typical *E. a. alpina* and not the more tawny-headed *schinzii.* I cannot separate *E. a. pusilla*, the supposed Eastern and Indian form, from the typical bird. Within Indian limits this little wader is very common on the coasts of north-western India. Inland it is very much less common, though during migration it occurs on some of the rivers and on some of the larger lakes. In eastern India it is certainly sometimes to be seen on the great tidal rivers running into the Bay of Bengal and I have myself seen them on the Brahmaputra about 700 miles from the sea. On the Megna, Hoogli and Ganges they cannot be said to be rare and I have seen them haunting mud flats in company with other small waders, sometimes singly or in pairs, or, very occasionally, in small flocks. Ticehurst (*Ibis* 1924, p. 111) says that the Dunlin is exceedingly abundant in Karachi harbour and the creeks and mud flats of the coast line, but that he seldom saw it inland, except on the Indus.

Nidification.—The Dunlin breeds over the whole of the northern portions of its summer haunts from the Scandinavian countries to somewhere in central Siberia. We found them breeding on tundras on the shores of the Arctic Ocean in Lapland, where very frequently nesting sites were chosen quite close to the houses of a tiny fishing village. One, indeed, I found within 50 yards of the nearest house. They breed both on the low-lying swamps close to the sea coast and on the wide tundra far inland, and Dr.

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Hortling and I were surprised to find birds breeding in swamps almost in the centre of Finland. I do not think they ever breed at any great distance from water and always in swampy ground and in open country. Even in Finland and Lapland, where so many waders breed on the outskirts of forests or even some distance inside them, the Dunlin never seems to choose a site for its nest in any marsh on which trees are growing. The nest itself is a very neat little cup of grass bents, either made from the actual living, growing grass or from bents which have been gathered by the bird for the purpose. This latter is especially the case when, as sometimes occurs, the birds choose a site among the roots of a juniper or creeping birch clump in which to build. Generally the nest is placed in grass, while a very favourite position is the summit of some small hummock in a sea of swamp. Here among the grass and moss on the top, the nest is carefully tucked away and concealed. Another favourite position is in the small patches of short thin grass growing on dry ground in what is otherwise all marsh land. In this, frequently, concealment is very indifferent and I have seen nests in which the eggs were perfectly visible from a distance of some yards. On the other hand, when the bird breeds in thick cover, as it often does, the nest is extremely difficult to find and sometimes even when the bird has risen almost at my feet I have taken some minutes to discover its home.

The eggs are, of course, always four in number and are of the usual rather long peg-top shape, like those of other small waders. They vary very greatly in colour, the majority having the ground of pale yellowish or olive stone and being densely marked with small and large blotches of colour varying from bright reddish brown to deep umber brown. In most eggs the impression given is that of rather greenish eggs, the ground colour almost invariably showing up well and the blotches being most numerous at the larger end and rather scanty elsewhere. The secondary markings are all lavender or rather inky grey but are, as a rule, inconspicuous. Occasionally the blotches at the larger end are much bigger than elsewhere and form indefinite groups, the marks coalescing and running into one another. A few eggs are stippled rather than blotched and in these the stipples are generally numerous all over the egg, a little larger and denser at the big end. The general impression of these eggs is rather bright reddish brown. In a collection of eggs belonging to Dr. Wasenius there are two very beautiful clutches of the Dunlin, one of which is of four eggs, pure pale blue, while in the second clutch the eggs have the same ground with a few faint lavender marks. In Witherby's *Handbook of Birds*, p. 571, Jourdain gives the following measurements for 100 eggs: average 34.3 by 24.4, maxima *38.3* by 25.4 and 35.0 by *25.8*, minima *31.3* by 23.2 and 32.0 by *23.0*. Jourdain also draws attention to the fact that the markings very often show signs of rotary movement in the oviduct. His remarks, it should be noted, refer to both the British form, *schinzii* and to the true *alpina*.

In the more southern portions of the breeding area the Dunlin

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commences to breed about the middle of May and in very warm seasons a week earlier than this, while in the extreme north I have taken perfectly fresh eggs up to the end of June.

At the same time it is extraordinary in what difficult circumstances these little birds sometimes breed. A few years ago, when on the shores of the Arctic Ocean, I found a nest of this bird containing four hard-set eggs in the first week of June. At the time it was snowing hard, a bitter east wind was blowing and all round the nest were several inches of snow, yet the eggs seemed to be in no way damaged. The little bird sat until I almost touched it and returned to the nest within a minute of my leaving it. As is well-known, the Dunlin often feigns injury or sickness in order to attract intruders from its nest. Recently it has been asserted that this action is merely due to a sudden fright and uncontrolled emotion and, therefore, quite purposeless. I cannot, however, for a moment believe this to be the case. I remember on one occasion Dr. Hortling and I found a Dunlin's nest in very open ground in a swamp. The bird sat on the nest until we were within two or three yards of it, when she flew quickly off. Then, seeing that we had noticed her, she at once fell to the ground, fluttering her wings as if seriously injured. As we approached she dragged herself away fluttering and continued to perform her antics so long as we followed her. However, directly we returned to the nest, she at once got up and flew perfectly soundly back to within a few yards of us, and seeing she had attracted our attention, she again went through her tricks. She repeated her attempts to attract us away three or four times and it was perfectly obvious that she carried them out with the intention of making us leave the nest and her precious eggs. At other times when disturbed from her nest the Dunlin leaps into flight, starting with three or four twists and little zig-zag motions, then mounting high in the air, she clears off altogether.

Both sexes take part in incubation and I think it is very probable that the male bird does the greater part of incubation by day. Certainly of those we got or shot during the day time at least 2 out of 3 were males. According to Evans the period of incubation is 22 days.

General Habits.—In western India, the first Dunlins arrive in the country very early in August and most of these are birds which have bred very early. They are generally in worn breeding dress and are undoubtedly adults and, according to Ticehurst, the younger birds arrive later. In Siam and Bengal I think few birds arrive in India before the end of August and these seem to be indifferently adults in worn breeding plumage and young birds. From these provinces most birds have left by the end of April, very few being seen in the first few days of May. In Sind, however, the majority seem to depart in the second and third week of May. Ticehurst saw a few as late as the 5th June and he remarks 'odd ones over-summer and unlike most waders are in summer dress'. Those, however, which wintered in eastern India left either in winter plumage or had only partially acquired breeding plumage. In their actions and feeding there is little to distin-

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guish Dunlins from other small waders. They may be seen scurrying hither and thither over their feeding ground, generally the coast line or muddy banks of rivers. They feed on the same sort of food, i.e., molluscs, snails, slugs, worms, sand-hoppers and all kinds of insects. They sometimes eat small seeds and various forms of grain, but this is perhaps exceptional. When at rest, the Dunlin sits with its head tucked close into its shoulders but, for the most part, it is constantly running rapidly from one place to another hunting for its food. In winter, its ordinary call note is a prolonged 'wee wee-e-et' and it is said also to have a soft 'purr'. These are the only notes we hear in India. In the breeding season, however, it has a very pretty little trilling love song which it utters fluttering in the air or, very occasionally, when perched on a high post or a bare limb of a tree.

Although its flight is rapid and well sustained, it is usually easy to approach, it cannot be placed among true sporting birds. The only specimen I have ever eaten was very plump and in taste like a dry snipe.

(*The end*).

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REVISION OF
THE FLORA OF THE BOMBAY PRESIDENCY.

BY

THE LATE E. BLATTER, S.J., PH.D., F.L.S.

PART XXVII.

(*Continued from page* 779 *of volume* xxxvii).

CYPERACEAE.

BY

THE LATE E. BLATTER, S.J., PH.D., F.L.S., and C. MCCANN, F.L.S.

20. CAREX Linn. (Cke. ii, 905).

Species 900.—Cosmopolitan, especially temperate, in marshes.

Cooke gives 3 species: *C. condensata*, *C. mercarensis* and *C. speciosa*. *C. condensata* has to be changed into *C. cruciata* and *C. mercarensis* will be put as var. under *C. Lindleyana*.

We add 9 more species which were not known to Cooke as occurring in the Presidency.

Key:

A. Style 2-fid
  Terminal spike female at base, male at top
    1. Spikes short, ovoid or oblong
      a. Utricle many-nerved on both faces ... 1. *C. nubigena.*
      b. Utricle nerveless on plane face ... 2. *C. foliosa.*
    2. Spikes linear-cylindric, peduncled, inflorescence loose ... ... 3. *C. brunnea.*

B. Style 3-fid
  I. Terminal spike female at base, male at top, or when spikes very numerous, many male at top, terminal spike sometimes wholly male
    1. Spikes short, very numerous
      a. Nut fitting utricle pretty closely, ellipsoid, substipitate, pyramidal at top; style-base scarcely dilated ... 4. *C. cruciata.*
      b. Nut ovate-elliptic. Style-base slightly thickened ... ... 5. *C. filicina.*
      c. Nut ovate, short-stipitate ... ... 6. *C. Lindleyana.*
    2. Spikes long-cylindric ... ... 7. *C. baccans.*
    3. Not to be placed among a and b ... 8. *C. speciosa.*
  II. Terminal spike wholly male. Spikes not very numerous, occasionally 12. Utricle hairy or minutely setulose ... ... 9. *C. glauca.*

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2. Not glaucous
   a. Rhizome long, creeping, many stolons 10. *C. setigera.*
   b. Rhizome short, stems caespitose ... 11. *C. Halleriana.*
   c. Rhizome creeping, stems caespitose ... 12. *C. breviculmis.*

1. **Carex nubigena** D. Don in Trans. Linn. Soc. xiv (1825) 326; C. B. Clarke in Hook. f. F.B.I. vi, 702.

Description: Stems 15-75 cm., caespitose on a tough perennial rhizome; rhizome short or 0. Leaves long, narrow, incurved when dry. Inflorescence from 1.3 cm., dense, ovoid, to 12.5 cm., linear, interrupted, greenish becoming brown; lowest bract usually much overtopping inflorescence, sometimes not 6 mm. Spikes 5 mm., dense, ovoid, androgynous; male at top forming an ovoid oblong or interrupted linear compound spike. Female glumes ovate, scarcely apiculate, shorter than utricle. Anthers linear-oblong, very shortly apiculate. Style 2-fid, occasionally 3-fid. Utricle small, of thin texture, plano-convex, green or pale brown, 9-11-nerved on plane face, 11-15 on convex; small red glands frequently scattered all over utricle between the nerves; beak not winged, commonly quite smooth, not rarely scabrid, sometimes almost hispid. Nut hardly ½ utricle, compressed, obtuse, brown.

Locality: *Sind*: (Pinwill ex Clarke).

Distribution: Himalaya, 5-13,000 ft., Khasia to Muneypoor, 4-600 ft., Sind. Nilgiris, Anamalais, Pulney Hills, Ceylon, Afghanistan, Malaya, China, Japan.

2. **Carex foliosa** D. Don in Trans. Linn. Soc. xiv (1825) 327.—*C. Wallichiana* Spreng. Syst. iii (1826) 812 (*non* Presc.).—*C. muricata* var. *foliosa* C. B. Clarke in Hook. f. F.B.I. vi, 703.

Description: Rhizome short, woody, caespitose. Stems up to 90 cm., strict, firm, triquetrous, very scabrous above. Leaves shorter or longer, 3-5 mm. broad, flat, sheaths thickened at the mouth, not longer than the base of the lamina; ligule broader than long, with a brown margin. Spikelets numerous, many-flowered, crowded towards the apex, the lower ones remote, compound, often setaceous-bracteate, forming an interrupted, 3-9 cm. long spike. Glumes ovate, acuminate-aristate, pale with a green keel. Utricle much exceeding the glumes, 3.5 mm. long, pale green, glabrous, almost nerveless, ovate or ovate-lanceolate below, narrowed into a slender 2-fid beak, margins scaberulous. Nut oval, filling the utricle. Base of style thickened. Stigmas 2.

Locality: *Sind*: (Pinwill ex Clarke).

Distribution: Himalaya, 6,000-9,000 ft., from Kashmir to Nepal and Sikkim, Khasia, Sind, Nilgiris, Pulney Hills, 6,500-8,000 ft.

3. **Carex brunnea** Thunb. Fl. Japon (1784) 38; C. B. Clarke in Hook. f. F.B.I. vi, 705.—*Ibidem* synonyms.

Description: Rhizome oblique. Stems 30-90 cm., slender. Leaves ⅔ stem, 4 mm. broad. Cauline sheaths somewhat distant, lowest usually above middle of plant. Inflorescence long, lax. Peduncles often several from each sheath, lowest exsert 2.5-20 cm., slender, nodding, sometimes bearing 3-10 spikes, often 2 or more from one sheath. Spikes 3.8-5 cm., slender. Male glumes obtusely triangular, reddish brown; female glumes ovate, acute or scarcely mucronate, apex triangular, ultimately ferruginous-brown. Utricle rather small, not parallel-sided, 9-15-nerved on each face, minutely hairy on nerves, suddenly narrowed into a beak about half utricle; beak linear, shortly bifid, lobes erect; ripe utricle brown ellipsoid, much flattened, pilose (in Indian examples), striate. Nut much flattened, ovoid, suddenly narrowed at top, yellow-brown, nearly filling utricle except beak. Exsert portion of stigmas about as long as utricle. Style 2-fid, about as long as beak, slightly swollen, contracted at base; branches long, very brown.

Locality: *Sind*: (Pinwill ex Clarke).

Distribution: W. Himalaya, Assam, Burma, Muneypore, Sind, Nilgiris, Anamalais, Pulneys, Tinnevelly Hills.—Ceylon, Mascarene Isles, Mauritius, China, Japan, Korea, Australia, Philippines, Sandwich Islands, Yunnan.

4. **Carex cruciata** Wahlenb. in Vet.-Akad. Handl. Stockholm xxiv (1803) 149; C. B. Clarke in Hook. f. F.B.I. vi, 715.—*C. condensata* Nees in Wight Contr. (1834) 123 (*excl. var.*); C. B. Clarke l.c.

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Description: Rhizome woody horizontal; over 15 cm. long. Culms 60-90 cm. tall. Leaves linear acuminate, 30-60 cm. long, 6-13 mm. wide, margins at tip scabrid. Panicles narrow, strict, erect, 5 cm. long, branches short pubescent. Spikelets 2.5-6 mm. long; flowers few. Glume ovate acuminate or mucronate, keeled. Utricle longer, ovate, yellow, orange, or olive-coloured, ribbed, beak long curved, margins scabrid entire. Nut ovate-elliptic.

Locality: *Sind*: (Pinwill ex Cooke).—*W. Ghats*: Mahableshwar (Dalzell & Gibson ex Cooke).—Not seen by Cooke.

Distribution: Himalaya from Kumaon to Sikkim and Bhutan, Khasia, Tenasserim and Malacca, Central Provinces, Sind.—Tonkin, China, Yunnan, Formosa, Madagascar.

5. **Carex filicina** Nees in Wight Contr. (1834) 126; C. B. Clarke in Hook. f. F.B.I. vi, 717.—*C. nilagirica* Hochst. ex Steud. Synops. *Cypera*. (1855) 207.

Description: Glabrous, except the minutely hairy panicle branches. Rhizome very woody, short (no long stolons). Stems 30-90 cm. Leaves very long, often as long as stems, flat, thin. Inflorescence elongate of distant pyramidal compound panicles. Panicle usually more than half stem; partial panicles often very dense; branches much slenderer than in *C. cruciata* or *condensata*. Spikes small often very many on slender branches not congested. Female glumes commonly small, not (or scarcely) mucronate, ovate, as long as utricle (without beak), sometimes elliptic-lanceolate, glabrous or minutely hairy, chestnut in South Indian form, often paler or ferruginous in the Khasian. Style 3-fid. Utricle 2.5 mm., trigonous, fitting the black nut very closely, about 15-nerved, glabrous, tapering or suddenly narrowed at top; beak oblique, curved, subrecurved or straight, more or less scabrous-hairy, mouth very small, shortly bifid.

Var. **meiogyna** Strachey Cat. Pl. Kumaon (1854) 73.

Description: Glumes smallish, ovate, mostly paler. Utricles broader, beak shorter.

Locality: *Sind*: (Pinwill ex Clarke).

Var. **minor** Boott Illustr. iii (1862) 106, t. 317-18.

Description: Leaves narrower, inflorescence paniculate, depauperate. Utricles shorter. Othrwise like *meiogyna*.

Locality: *Sind*: (Pinwill ex Clarke).

Distribution of species: Nilgiris, Pulneys, throughout the Himalayas, Assam, Burma.—Ceylon, Tonkin, China, Yunnan, Java, Borneo, Sumatra.

6. **Carex Lindleyana** Nees in Wight Contr. (1834) 121; C. B. Clarke in Hook. f. F.B.I. vi, 721.

Var. **major** Fischer in Flora Madras ix (1931) 1687.—*C. mercarensis* Hochst ex Steud. Syn. Pl. Cyper. (1855) 194, var. *major* Steud. l.c.; Cke. ii, 906.

Description: Cke. l.c.

Locality: Without locality (Dalzell !).—*Konkan*: Ambewadi (Patwardhan 1104 !).—*W. Ghats*: Matheran (Herb. St. X.C. C20 ! C21 !, H.E.B.B. !); Mahableshwar (Ezekiel !, Woodrow 79 ex Cooke), Bombay Point (Fernandez C152 !), Fitzgerald Ghat, 3 miles from Mahableshwar (Blatter C154 !, McCann !); Panchgani (Talbot 4475 !, Blatter & Hallberg B1737 !); common (McCann !); Londa (Woodrow ex Cooke); Castle Rock, 1,700 ft., rainfall 200 in. (Herb. Sedgwick & Bell 5552 !, McCann C23 !, Gammie 15765 ! 15887 !).—*S. M. Country*: Belgaum (Hole 23 !).—*N. Kanara*: Arbail Ghat, 2,000 ft., rainfall 200 in. (Sedgwick 3129 !); Anmod, forest, 2,000 ft., rainfall 200 in. (Sedgwick 3453 !); Devimane Ghat (Hallberg & McCann C24 !); Kilkund (Talbot 3531 !); Yellapur (Talbot 667 !); Jugglepet (Talbot 1564 !); Armhi Ghat (Talbot 1321 !); Guddehulli peak, Karwar (Bell 7737 !).

Flowering & fruiting: March 1918 (Matheran); March 1919 (Castle Rock); March 17th 1917 (Mahableshwar); September 21st 1883 (Yellapur); September 25th 1884 (Yellapur); October 1920 (Panchgani); October 10th 1885 (Armhi Ghat); October 11th 1928 (Mahableshwar); October 28th 1902 (Castle Rock);

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October 29th (Panchgani); November 1910 (Kanara District); November 1917 (Arbail Ghat); November 1929 (Fitzgerald Ghat); November 14th 1885 (Jugglepet); December 1917 (Anmod); December 1920 (Guddehulli); December 1st 1895 (Nilkund); December 12th 1896 (Matheran).

Field notes: A monsoon species in deciduous forest, but it lasts longer in evergreens, practically throughout the year. The flowering commences about the middle of September.

A weak looking sedge growing in tufts under the shade of trees. The rhizomes are black and woody. They persist for years.

Distribution: Deccan, S. M. Country, N. Kanara, Mercara, Attapadi, Anamalais, Pulney Hills, High Wavy Mountain, 5,000-8,000 ft.

7. **Carex baccans** Nees in Wight Contr. (1834) 122; C. B. Clarke in Hook. f. F.B.I. vi, 722.

Description: Robust, glabrous. Rhizome very stout, short, horizontal, with approximate stems. Stems often 0.9 m. Leaves often overtopping inflorescence, 8 mm. broad. Inflorescence 30-45 by 7.5-10 cm. (small examples occur); bracts much overtopping inflorescence; lowest peduncle usually distant, exsert; partial panicle often 5-12.5 by 2.5-5 cm. Spikes 3.8 by 0.6 cm., male portion dark red when young. Female glumes ovate or obovate, acute or obtuse, often cuspidate sometimes (even in large examples) muticous. Utricle in the fully developed state 2.5 mm. diameter, nearly globose, wall thickened more or less succulent, red, nearly glabrous rarely obscurely scabrous-hairy near top; utricles in the half-ripe state usually olivaceous with more prominent recurved beak. Nut ellipsoid-trigonous, pyramidal at both ends, black, much narrower than utricle; style-base linear.

Locality: Without locality (Dalzell !).—*W. Ghats*: Mahableshwar (Herb. Sedgwick & Bell 7285 !, Blatter 1594 !).

Flowering & fruiting: November 1919 (Mahableshwar); November 1929 (Mahableshwar).

Distribution: Nepal, Sikkim, Khasia and Naga Hills, Upper Burma, Ganjam District, W. Ghats of Madras Presidency, 3,000-7,000 ft., Mysore.—Ceylon, Cochin-China, Malay Archipelago, Philippines, Formosa, South China.

8. **Carex speciosa** Kunth Enum. ii (1837) 504; Cke. ii, 906.—For synonyms see C. B. Clarke in Hook. f. F.B.I. vi, 729.

Description: Cke. l.c.

Locality: *N. Kanara*: Hulgi, in mixed forest (Talbot 3142 !, 2 sheets, Talbot 2282 ex Cooke).

Flowering & fruiting: April 20th and 28th 1894 (Hulgi).

Distribution: Throughout India.—Tonkin, Borneo.

9. **Carex glauca** Murr. Prodr, Stirp. Gotting. (1770) 76; Kükenth. in Engler's Pflanzenr. iv, 20 (1909) 416.—*C. flacca* Schreb. Spic. Fl. Lips. Append. (1771) 669.

Description: Rhizome producing long stolons. Culm 20-45 cm. high, rigid, obsoletely triquetrous, smooth, leafy below. Leaves shorter than the culm, 2-4 mm. broad, with the margins revolute, keeled, glaucous, patent, the lower sheaths brown-purple. Spikelets 4-5, the upper 2-3 (rarely 1) male, cylindrical, the lower 2-3 female (at the apex often male), thinly cylindrical, 2-3 cm. long, dense-flowered, more or less pedunculate, erect or finally pendulous, peduncles setaceous, scabrous. Bracts foliaceous, the lowest often exceeding the inflorescence, sometimes shortly sheathing. Female glumes ovate or oblong-ovate, slightly acute, black-brown, often very shortly mucronate. Utricles slightly exceeding the glumes, finally membranous, ovate-ellipsoid or subobovate, subinflated trigonous, 3 mm. long, straw-coloured-greenish, nerveless except 2 marginal nerves, truncate at base, on the margins above sometimes sparingly scabrous, beak very short, truncate, often curved outwardly. Nut obovate, trigonous. Stigmas 3.

Var. **cuspidata** (Host.) Aschers. *et* Graebner Synops. Mitteleurop. Fl. ii, 2 (1902-03) 138.—*C. cuspidata* Host. Gram. Austr. i (1801) 71, t. 97.—*C. flacca* C. B. Clarke in Hook. f. F.B.I. vi, 742.

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Description: Female spikelets slender, pedunculate, erect. Male glumes narrowed, female mucronate or aristate. Utricles shorter than the glumes, ellipsoid, olivaceous, acute at apex.

Locality: *Sind*: (Pinwill ex Clarke).

Distribution of var.: Mediterranean, North Africa, Western Asia, Orient, Sind.

10. **Carex setigera** D. Don in Trans. Linn. Soc. xiv (1824) 330; C. B. Clarke in Hook. f. F.B.I. vi, 743.

Decsription: Glabrous, stoloniferous. Rhizome long, creeping, 2.5 mm. diameter. Stems 30-60 cm. Leaves nearly as long as stem, 3-4 mm. broad. Spikes 4-8, 3.8-5 cm. long, cylindric, distant, terminal 1 (or 2-3) male, lowest female, peduncled erect, female up to 8 mm. broad; spike often male at top, rather lax, often interrupted at base. Female glumes as long as utricle, with a bristle much overtopping utricle in the standard form (which is often small or disappears) usually with bright brown sides and scarious margins (but the colour of male and female glumes varies widely). Utricles 2-5.2 mm.; ovoid, hispid, suddenly narrowed into small oblong notched beak, brown-green, very hispid, nerveless, strongly 2-edged, the concave face only obscurely ridged by the angle of nut, margined by the incurved edges. Nut ellipsoid, trigonous, narrowed much at base, dark brown; style slender, glabrous, 3-fid, base not dilated; exsert part of branches about as long as utricle.

Var. **Schlagintweitiana** (Boeck) Kükenth. in Engl. Pflanzenr. iv, 20 (1909) 419.—*C. Schlagintweitiana* Boeck. Cyp. Nov. i (1888) 48; C. B. Clarke l.c.

Description: Leaves narrower. Spikelets narrower, often shorter. Female glumes mostly only mucronate. Utricles small, with a shorter beak.

Locality: *Sind*: (Pinwill ex Clarke).

Distribution of var.: Yarkand, W. Himalaya, Yunnan, Sind.

11. **Carex Halleriana** Asso Synops. Stirp. Arag. (1779) 133. t. 9, fig. 2; C. B. Clarke in Hook. f. F.B.I. vi, 745.—*Ibidem* synonyms.

Description: Rhizome stout, densely caespitose, many-branched. Culm 10-40 cm. high, weak, obsoletely triquetrous, upwards scabrous. Leaves shorter than the culm, 1.5-2.5 mm. broad, with the margins revolute, scabrous above, bright green, subrigid, lower sheaths brown. Spikelets 3-6, the terminal one male, linear-oblong, 1-1.5 cm. long, sessile or shortly pedunculate, lateral ones 2-5 female (at the apex often male), ovate, few and subdensely flowered, 8-10 mm. long, the upper 1-3 spikelets male, approximate, subsessile, the lower 1-2 very long—unequally pedunculate, capillary peduncles decumbent, sparsely scabrous. Bracts scale-like, amplexicaul, the lowest shortly setaceous. Female glumes lanceolate ovate, muticous or mucronate, chestnut or copper-coloured, the margins white-hyaline, on the back greenish 3-nerved. Utricles longer than the glumes, finally obliquely patent, membranous, obovate-oblong, trigonous, 4-5 mm. long, brownish green, minutely and sparsely pubescent, many-costate, long-attenuate into a winged stalk. Nut tightly enclosed oblong-obovate, stipitate; base of style thickened. Stigmas 3.

Locality: *Sind*: (Pinwill ex Clarke).

Distribution: Mediterranean, Europe, N. Africa, W. Asia, Orient, Sind.

12. **Carex breviculmis** R. Br. Prodr. Nov. Holl. (1810) 242; C. B. Clarke in Hook. f. F.B.I. vi, 746.—*C. Royleana* Nees ex Wight Contr. (1834) 127.

Description: Slender, glabrous, except utricles. Rhizome creeping. Stems caespitose, 10-40 cm. Leaves often $\frac{3}{4}$ stem, 3 mm. broad, flat. Spikes 2-5, oblong, rather small, usually approximate, subsessile; terminal one male pale, lowest female sometimes 15 cm. distant on 5 cm. peduncle, with 8-14 utricles. Female ripe spikes 8 by 4 mm. Female glumes with long bristle much exceeding utricles. Style 3-fid, at base dilated green, sometimes forming a button as in the nuts of *Eleocharis*. Utricle small, ellipsoid, trigonous, slightly hairy, tip pyramidal.

Locality: *Sind*: (Pinwill ex Clarke).

Distribution: N.-W. Himalaya, Assam, Khasia Hills, Nilgiris, Pulneys.—Tonkin, China, Japan, Formosa, Korea, Australia, New Zealand.

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THE CYPERACEAE IN COOKE AND THE PRESENT PAPER.

		Sp. in Cooke.	Sp. in this paper.	
1.	*Kyllinga*	2	5	
2.	*Pycreus*	9*	10	*under *Cyperus*.
3.	*Juncellus*	3*	3	*under *Cyperus*.
4.	*Cyperus*	27	35	
5.	*Mariscus*	5*	6	*under *Cyperus*.
6.	*Courtoisia*	1	1	
7.	*Eleocharis*	7	8	
8.	*Fimbristylis*	17	18	
9.	*Bulbostylis*	1	3	
10.	*Scirpus*	11	13	
11.	*Eriophorum*	1	1	
12.	*Fuirena*	4	4	
13.	*Lipocarpha*	...	2	
14.	*Rhyncospora*	3	2	
15.	*Schoenus*	...	1	
16.	*Remirea*	1	1	
17.	*Hypolytrum*	1	1	
18.	*Scleria*	6	8	
19.	*Diplacrum*	...	1	
20.	*Carex*	3	12	
	Total ...	102	135	

We have combined *Cyperus tegetiformis* and *C. tegetum* with *C. corymbosus* Rottb.; *C. tuberosus* with *C. rotundus*; *Scirpus Michelianus* with *Juncellus pygmaeus*; and *Scirpus Kysoor* with *S. grossus*.

We have excluded from the Bombay Flora *Rhyncospora Wallichiana*.

DISTRIBUTION OF GENERA IN THE PRESIDENCY.

	No. of species in the Presy.	Sind.	Cutch.	Kathiawar.	Gujerat.	Khandesh.	Deccan.	Konkan.	W. Ghats.	S.M. Country.	N. Kanara.
1. *Kyllinga* ...	5	1	...	...	1	...	2	4	5	4	4
2. *Pycreus* ...	10	3	1	...	3	1	5	8	9	6	8
3. *Juncellus* ...	3	2	1	1	3	2	3	3	1	3	2
4. *Cyperus* ...	35	17	9	1	16	5	13	21	17	18	22
5. *Mariscus* ...	6	1	...	...	...	...	1	3	5	3	3
6. *Courtoisia* ...	1	...	...	...	...	...	...	1	...	1	1
7. *Eleocharis* ...	8	4	...	...	3	1	1	5	4	5	6
8. *Fimbristylis* ...	18	10	1	1	12	4	9	15	12	15	16
9. *Bulbostylis* ...	3	1	...	...	1	...	1	...	1	2	3
10. *Scirpus* ...	13	10	2	1	8	2	4	6	5	5	8
11. *Eriophorum* ...	1	1	...	...	1	1	1	...	...	...	...
12. *Fuirena* ...	4	...	...	1	1	1	2	1	3	2	3
13. *Lipocarpha* ...	2	...	...	...	...	...	...	...	1	1	2
14. *Rhyncospora* ...	2	...	..	...	...	...	1	1	2	1	2
15. *Schoenus* ...	1	1	...	...	...	...	...	...	...	...	...
16. *Remirea* ...	1	...	...	...	...	...	...	...	...	...	1
17. *Hypolytrum* ...	1	...	...	...	...	...	...	...	1	...	1
18. *Scleria* ...	8	...	...	...	1	...	1	5	3	2	7
19. *Diplacrum* ...	1	...	...	..	...	...	...	...	...	...	1
20. *Carex* ...	12	9	...	...	...	...	...	1	3	1	2
Total ...	135	60	14	5	50	17	44	74	72	69	92

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DISTRIBUTION OF SPECIES IN THE PRESIDENCY.

	Sind.	Cutch.	Kathiawar.	Gujerat.	Khandesh.	Deccan.	Konkan.	W. Ghats.	S. M. Country.	N. Kanara.	
KYLLINGA											
1. *triceps* ...	*	...	...	*	...	*	*	*	*	...	Conctd. in the Deccan.
2. *melanosperma* ...	...	...	...	...	...	...	...	*	*	*	
3. *squamulata* ...	...	...	...	...	...	...	*	*	...	*	
4. *brevifolia* ...	...	.	...	...	...	*	*	*	*	*	
5. *monocephala* ...	...	..	...	...	...	.	*	*	*	*	Conctd. in the Konkan.
Total ...	1	...	..	1	...	2	4	5	4	4	
PYCREUS											
1. *flavescens* ...	...	...	...	...	...	*	...	*	...	*	
2. *latespicatus* ...	...	...	...	...	...	*	*	*	*	*	Conctd. in the Deccan.
3. *malabaricus* ...	.	...	...	...	...	...	...	*	...	*	
4. *sanguinolentus* ...	•	...	...	...	...	*	*	*	*	*	Conctd. in the Deccan.
5. *puncticulatus* ...	...	...	...	...	...	...	*	*	...	...	
6. *albomarginatus* ...	...	..	...	..	...	...	*	*	*	*	Conctd. in the Konkan.
7. *globosus* ...	...	...	...	*	•	*	*	*	*	*	Conctd. in the Deccan.
8. *odoratus* ...	*	*	...	*	...	...	*	*	*	*	Conctd. in N. Kanara.
9. *hyalinus* ...	...	...	...	..	...	...	*	...	...	...	
10. *pumilus* ...	*	...	...	*	...	*	*	*	*	*	
Total ..	...	1	...	3	1	5	8	9	6	8	
JUNCELLUS											
1. *alopecuroides* ...	*	...	...	*	...	*	*	...	*	*	
2. *Michelianus* ...	...	*	...	*	*	*	•	*	*	*	
3. *laevigatus* ...	*	...	*	•	*	*	*	...	*	...	
Total ...	2	1	1	3	2	3	3	1	3	2	

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DISTRIBUTION OF SPECIES IN THE PRESIDENCY.—*contd.*

	Sind.	Cutch.	Kathiawar.	Gujerat.	Khandesh.	Deccan.	Konkan.	W. Ghats.	S. M. Country.	N. Kanara.	
CYPERUS.											
1. *cephalotes* ...	...	.	...	...	...	...	...	...	...	*	
2 *platystylis* ...	...	...	...	...	...	...	...	...	...	*	
3. *castaneus* ...	...	...	...	...	...	...	*	...	...	...	
4. *uncinatus* ...	*	...	...	...	...	...	...	*	...	.	
5. *Meeboldii* ...	...	...	...	...	...	.	...	...	*	...	
6. *difformis* ...	...	...	...	*	*	*	*	*	*	*	Conctd. in the Deccan.
7. *pulcherrimus* ...	*	...	...	...	...	...	...	...	...	...	
8. *flavidus* ...	...	*	...	*	...	*	*	*	*	*	Conctd. in the Deccan and Konkan.
9. *Haspan* ...	...	*	...		...	...	*	*	...	*	Conctd. in N. Kanara.
10. *Teneriffae* ...	...	...	...	...	...	*	...	..	*	...	
11. *niveus* ...	*	...	...	*	...		...	...	...	...	
12. *leucocephalus* ...	...	...	...	...	...	...	*	...	*	*	
13. *arenarius* ...	*	*	...	*	...	...	*	...	...	*	
14. *conglomeratus* ...	*	*	*	*	...	...	*	...	...	...	
15. *effusus* ...	*	...	...	...	...	...	...	...	...	...	
16. *Atkinsoni* ...	*	...	...	...	...	...	...	...	...	...	
17. *compressus* ...	*	...	..	*	...	*	*	*	*	*	Conctd. in the Deccan and N. Kanara.
18. *glaber* ...	*	...	...	...	...	...	...	...	...	...	
19. *aristatus* ...	...	...	...	*	...	*	*	*	*	*	Conctd. in the Deccan chiefly and N. Kanara.
20. *Iria* ...	*	*	...	*	...	*	*	*	*	*	Conctd. in the Deccan and Konkan.
21. *distans* ...	...	...	...	...	...	...	...	*	*	*	
22. *nutans* ...	..	...	...	...	...	*	*	*	*	*	
23. *eleusinoides* ...	*	...	...	*	*	*	*	*	*	*	Conctd. in the Deccan.
24. *pilosus* ...	...	...	...	...	...	...	*	*	*	*	
25. *procerus* ...	...	...	...	...	...	...	...	...	*	...	
26. *malaccensis* ...	*	...	...	...	...	..	*	...	...	*	
27. *bulbosus* ...	*	*	...	*	...	*	*	*	...	*	
28. *articulatus* ...	...	...	...	*	...	...	*	*	*	*	
29. *corymbosus* ...	*	*	...	*	...	*	*	*	*	*	Conctd. in the Deccan and Konkan.
30. *macer* ...	..	...	...	*	*	...	...	*	...	*	
31. *rotundus* ...	*	*	..	*	*	*	*	*	*	...	Conctd. in Sind, Deccan and Konkan.
32. *esculentus* ...	...	...	...	*	...	...	.	...	...	...	
33. *stoloniferus* ...	*	*	...	...	...	...	*	...	...	*	
34. *exaltatus* ...	*	...	...	*	*	*	*	*	*	*	
35. *digitatus* ...	.	...	...	...	...	*	*	*	*	*	
Total ...	17	9	1	16	5	13	21	17	18	22	
MARISCUS											
1. *blatteri* ...	...	...	...	...	...	...	...	*	...	...	
2. *bulbosus* ...	...	...	...	...	...	...	...	...	*	*	
3. *paniceus* ...	...	...	..	..	...	...	*	*	*	*	
4. *konkanensis* ...	...	...	...	...	...	*	...	*	...	...	
5. *pennatus* ...	...	...	...	...	.	...	*	*	...	...	Concentrated in the Konkan.
6. *compactus* ...	*	...	...	...	...	...	*	*	*	*	
Total ...	1	...	...	...	...	1	3	5	3	3	

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DISTRIBUTION OF SPECIES IN THE PRESIDENCY.—*contd.*

—	Sind.	Cutch.	Kathiawar.	Gujerat.	Khandesh.	Deccan.	Konkan.	W. Ghats.	S.M. Country.	N. Kanara.	—
COURTOISIA											
1. *cyperoides* ...	...	...	...	...	...	...	*	...	*	*	Concentrated in the S. M. Country.
Total ...	...	...	...	...	...	...	1	...	1	1	
ELEOCHARIS											
1. *plantaginea* ...	*	...	...	*	...	...	*	...	*	*	
2. *fistulosa* ...	...	...	...	..	...	.	..	*	*	*	
3. *spiralis* ...	...	..	...	...	...	...	*	...	...	*	
4. *atropurpurea* ...	*	..	..	*	...	...	*	*	...	*	
5. *capitata* ...	*	...	...	*	*	*	*	*	*	*	Concentrated in the Deccan and Konkan.
6. *palustris* ...	*	...	...	...	...	...	...	...	...	...	
7. *chaetaria* ...	...	...	...	...	...	...	*	*	*	*	Concentrated in N. Kanara.
8. *congesta* ...	...	...	...	...	...	...	...	...	*	...	
Total ...	4	...	...	3	1	1	5	4	5	6	
FIMBRISTYLIS											
1. *tetragona* R. Br.	...	...	..	...	...	*	*	*	*	*	
2. *acuminata* ...	...	...	...	..	...	...	...	...	*	*	
3. *polytrichoides* ...	...	...	...	...	...	...	*	...	...	*	
4. *schoenoides* ...	*	...	...	*	...	...	*	*	*	*	Concentrated in the Konkan.
5. *argentea* ...	...	...	...	*	...	...	...	...	...	*	
6. *aestivalis* ...	...	...	...	...	...	*	*	*	*	*	
7. *dichotoma* ...	*	...	*	*	*	*	*	*	*	*	
8. *spathacea* ...	*	...	...	*	...	...	*	...	*	*	Concentrated in Gujerat, Khandesh and Deccan.
9. *annua* var. *diphylla* ...	*	...	..	*	...	*	*	*	*	*	Concentrated in the Konkan.
10. *ferruginea* ...	*	*	...	*	*	*	*	*	*	*	Concentrated in the Deccan.
11. *digitata* ...	...	...	...	...	...	...	*	*	*	*	Concentrated in the Deccan and N. Kanara.
12. *Woodrowii* ...	...	...	...	...	...	...	*	*	...	*	
13. *tenera* ...	...	...	...	*	*	*	*	*	*	...	Concentrated in the Konkan.
14. *junciformis* ...	*	...	...	*	..	*	*	...	*	*	Concentrated in the Konkan.
15. *miliacea* ...	*	...	...	*	...	...	*	*	*	*	
16. *quinquangularis*	*	...	...	*	...	...	*	*	*	*	
17. *complanata* ...	*	...	...	*	*	*	...	*	*	...	
18. *monostachya* ...	*	...	...	*	...	*	*	...	*	*	
Total ...	10	1	1	12	4	9	15	12	15	16	

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DISTRIBUTION OF SPECIES IN THE PRESIDENCY.—*contd.*

	Sind.	Cutch.	Kathiawar.	Gujerat.	Khandesh.	Deccan.	Konkan.	W. Ghats.	S. M. Country.	N. Kanara.	
BULBOSTYLIS											
1. *barbata* ...	*	...	...	*	...	*	...		*	*	
2. *capillaris* var. *trifida* ...	..	...	...	..	...	...	...	*	*	*	
3. *puberula* ..	...	...	...	..	...	...	...	...	...	*	
Total ...	1	...	...	1	...	1	...	1	2	3	
SCIRPUS											
1. *Holoschoenus* ...	*	..	...	...	...	...	...	...	.	...	
2. *supinus* ...	*	...	...	*	...	*	*	*	*	*	Conctd. in the Deccan.
3. *articulatus* ..	*	...	...	*	...	*	*	*	*	*	Conctd. in the Konkan.
4. *quinquefarius* ..	*	*	...	*	...	*	*	...	...	...	
5. *corymbosus* ...	*	..	...	*	*	...	..	*	...	...	
6. *maritimus* ...	*	*	...	*	*	*	*	...	*	*	Conctd. on the sea coasts.
7. *triqueter* ...	*	...	..	...	...	...	...	...	...	...	
8. *grossus* ...	*	...	...	...	...	*	*	...	...	...	Conctd. in the Konkan.
9. *littoralis* ...	*	...	*	*	...	...	...	...	...	*	Conctd. in Gujerat.
10. *mucronatus* ...		...	...	*	...	...	*	*	*	*	
11. *erectus* ...	...	...	...	...	..	...	...	...	*	*	
12. *kyllingoides* ...	...	...	...	...	...	...	...	...	...	*	
13. *squarrosus* ...	*	...	.	*	..	...	...	*	...	*	
Total ...	10	2	1	8	2	4	6	5	5	8	
ERIOPHORUM											
1. *comosum* ...	*	...	...	*	*	*	...	...	...	...	
Total ...	1	...	...	1	1	1	...	...	...	...	
FUIRENA											
1. *wallichiana* ...	...	..	...	...	*	*	...	*	*	..	Concentrated in the Deccan.
2. *ciliaris* ...	...	...	*	*	...	...	*	*	*	*	Concentrated in the Konkan and S.M.C.
3 *uncinata* ...	...	...	...	...	...	...	...	...	...	*	
4. *umbellata* ..	...	...	...	.	...	*	...	*	...	*	Concentrated in the S. M. Country.
Total ...	...	...	1	1	1	2	1	3	2	3	
LIPOCARPHA											
1. *argentea* ...	...	...	...	...	...	...	...	*	..	*	
2. *triceps* ...	...	...	...	...	...	...		..	*	*	
Total ...	...	...	...	...	...	...	...	1	1	2	

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DISTRIBUTION OF SPECIES IN THE PRESIDENCY.—*contd.*

	Sind.	Cutch.	Kathiawar.	Gujerat.	Khandesh.	Deccan.	Konkan.	W. Ghats.	S.M. Country.	N. Kanara.	
RHYNCOSPORA											
1. *wightiana* ...	..	...	...	...	...	*	*	*	...	*	Concentrated in the Deccan and Konkan.
2. *corymbosa* ...	...	...	...	...	...	...	...	*	*[1]	*	[1] Locality doubtful.
Total ...	...	...	.		..	1	1	2	1	2	
SCHOENUS											
1. *nigricans* ...	*	.	...	...	...	...	..	...	...	...	
Total ...	1	...	.	...	...	...	..	...	..	...	
REMIREA											
1. *maritima* ...	.	...	...	...	...	...	...	...	...	*	
Total ...	...	..	...	...	...	...	...	...	...	1	
HYPOLYTRUM											
1. *latifolium* ...	...	..	...	...	...	.	...	*	...	*	
Total ...	...	...	...	..	...	...	...	1	..	1	
SCLERIA											
1. *tesselata* ...	...	..	...	...	...	...	*	...	...	*	
2. *lithosperma* ...	...	...	...	...	...	...	*	*	...	*	Conctd. in N. Kanara.
3. *corymbosa* ...	...	...	...	...	...	...	...	...	*	...	
4. *hebecarpa* ..	...	...	...	...	...	...	*	...	...	*	Conctd. in N. Kanara.
5. *poaeformis* ...	..	..	...	...	...	...	...	...	...	*	
6. *cochinchinensis*	...	...	...	...	...	...	.	*	...	*	
7. *annularis* ..	...	...	...	..	...	...	*	...	...	*	
8. *Stocksiana* ...	...	...	...	*	...	*	*	*	*	*	
Total ...	..	...	...	1	...	1	5	3	2	7	
DIPLACRUM											
1. *caricinum* ...	...	...	...	...	...	...	...	...	...	*	
Total ...	...	...	...	...	...	...	...	...	...	1	

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DISTRIBUTION OF SPECIES IN THE PRESIDENCY.—*contd.*

	Sind.	Cutch.	Kathiawar.	Gujerat.	Khandesh.	Deccan.	Konkan.	W. Ghats.	S. M. Country.	N. Kanara.	
CAREX											
1 *nubigena* ...	*	...	...	...	...	...	...	...	...	...	
2. *foliosa* ...	*	...	...	...	...	...	...	...	...	...	
3. *brunnea* ...	*	...	...	...	...	...	...	...	...	...	
4. *cruciata* ...	*	...	..	...	...	...	...	*	...	...	
5. *filicina* var. *minor et* var. *meiogyna* ...	*	..	...	...	...	...	...	...	...	...	
6. *Lindleyana* var. *major* ...	...	...	...	...	...	...	*	*	*	*	Conctd. in the Deccan and N. Kanara.
7. *baccans* ...	...	...	...	...	...	...	...	*	...	...	
8. *speciosa* ...	...	...	...	...	...	...	...	...	...	*	
9. *glauca* var. *cuspidata* ...	*	...	...	...	...	...	...	...	...	...	
10. *setigera* var. *Schlagintweitina* ...	*	...	...	...	...	...	...	...	...	...	
11. *Halleriana* ...	*	...	...	...	...	...	...	...	...	...	
12. *breviculmis* ...	*	...	...	...	...	...	...	...	...	...	
Total ...	9	...	...	...	...	...	1	3	1	2	

SOME NOTES ON THE GEOGRAPHICAL DISTRIBUTION OF THE CYPERACEAE IN THE PRESIDENCY.

Of the 135 species recorded so far from the Presidency 16 are peculiar to Sind, viz.:

Cyperus pulcherrimus Willd.
Cyperus effusus Rottb.
Cyperus Atkinsoni C. B. Clarke
Cyperus glaber Linn.

Eleocharis palustris R. Br.
Scirpus Holoschoenus Linn.
Scirpus triqueter Linn.
Schoenus nigricans Linn.

Carex nubigena D. Don.
Carex foliosa D. Don.
Carex brunnea Thunb.
Carex filicina Nees var. *meiogyna* et var. *minor*.
Carex glauca var. *cuspidata*.
Carex setigera var. *Schlagintweitiana*.
Carex Halleriana Asso.
Carex breviculmis R. Br.

One to Gujerat: *Cyperus esculentus* Linn.
2 to the Konkan: *Pycreus hyalinus* Don, and *Cyperus castaneus* Willd.
2 to the W. Ghats: *Mariscus Blatteri* McCann, and *Carex baccans* Nees.
3 to the Southern Maratha Country: *Cyperus Meeboldii* Kükenthal, *Eleocharis congesta* Don, and *Scleria corymbosa* Roxb., and 9 to N. Kanara.

Cyperus cephalotes Vahl.
Cyperus platystylis R. Br.
Bulbostylis puberula Kunth.
Scirpus kyllingoides Boeck.
Fuirena uncinata Kunth.

Remirea maritima Aubl.
Scleria poaeformis Retz.
Diplacrum caricinum R. Br.
Carex speciosa Kunth.

How are we to explain this peculiar distribution? The large number of species peculiar to Sind may be accounted for by the presence of the Indus River as it may be responsible for the introduction of some of the species from the northern part of India. But this alone does not seem to account for this

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distribution. Sind is the wintering ground for many wild fowl such as ducks and waders, some of which never descend lower down into the Presidency. A great number of these migrant birds come from the North, North-West and West and in so doing bring along the seed of various plants in the mud that frequently adheres to their bills, feet and plumage, and have in this way added to our Cyperaceous flora especially as this order comprises plants that are inhabitants of marshes and stretches of water. For example *Cyperus glaber* is so far only recorded from Sind, the distribution is given as 'Westwards to Sicily'; similarly *C. effusus* has also only been recorded from Sind the distribution being given as westwards to N. Africa. Is it not possible that these two species were introduced by aquatic birds? Some of these records are over thirty years old and it appears strange that since that time (Pinwill) they have not been obtained again. It seems very probable that these were just chance specimens which happened to survive for a short time in the new locality and then died out. Sind is poorly explored, and this may also account for the absence of further data.

Khandesh is in a similar position as Kathiawar, but for the few records places are unexplored from a Cyperologist's point of view as is easily seen from the records we have at hand. Fr. Blatter collected in Cutch during the winter of 1907-08, but as these plants are so much dependent on water it was an unsuitable time. Kathiawar is almost a blank; there is not the slightest doubt that it still remains a closed book as there has never been any serious collecting done in the area.

Khandesh is in a similar position as Kathiawar but for the few records from the West and along the Tapti River made by Fr. Blatter, the late Prof. Hallberg and Mr. McCann during the winters of 1916-17 and 1918-19. Both these trips were of short duration and the time was most unsuitable for *Cyperaceae*. We are sure that with the further investigation of these areas the distribution of some of the species will be extended.

Coming down to the W. Ghats 2 of the 3 species are from the Mahableshwar ranges, whose heavy rainfall might well be compared with that of N. Kanara. The demarcation between the W. Ghats and the Konkan is very vague and it is difficult to attribute this or that species to one or the other of these areas. Two species are peculiar to the Konkan. The Southern Maratha Country yields three species peculiar to it but as there is no saying where the S. M. Country ends and Kanara begins perhaps a few more species might as well be added to those already mentioned for Kanara.

How are we to account for the large number of species peculiar to Kanara? Kanara was well explored by Talbot, whose large collections testify to this, and also by subsequent collectors. This may be one of the reasons but the Konkan has also been well explored and yet the number is small compared with that for Kanara. It is possibly due to the heavy rainfall Kanara receives and also to the dense evergreen forests. The Nilgiris hold some of the species and perhaps also the adjoining country which is still unexplored. Is it possible that some of these plants have come with wandering animals, such as elephants, bison and deer? But we know very little on this point to draw any definite conclusions. Most of the species that occur in Kanara are forest species, *Remirea* alone occurring on the sandy seacoast.

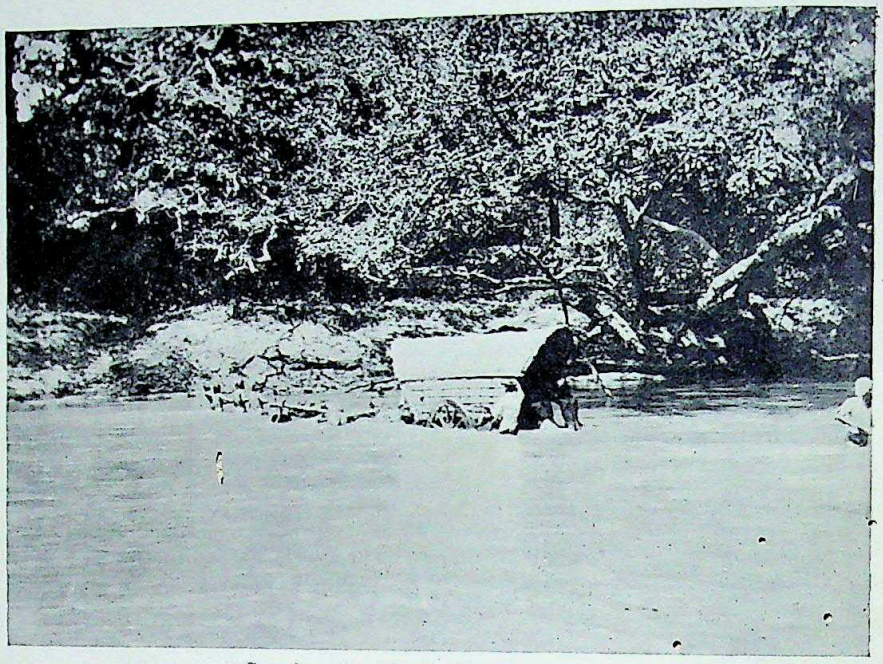
(*To be continued*).

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Crossing the Menik Ganga, Ceylon.



Spotted Deer (*Axis axis*) at margin of forest.

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A GAME SANCTUARY IN CEYLON.

BY

LIEUT.-COL. R. W. BURTON,

Indian Army (retired).

(*With a plate*).

It was with the kind permission of the Minister for Agriculture and Lands, and in the company of the Government Agent for the Southern Province (Mr. J. D. Brown), and his Assistant for the District of Hambantota (Mr. F. L. Leach), that the writer had the privilege to visit the Yala Game Sanctuary in February 1933.

This Sanctuary came into existence in February 1899, the area set apart being bounded on the east by the Kumbukkan-oya, on the south by the sea, the west by the river Menik Ganga, and the north by a demarcation line cleared through the jungle. In length about 16 miles by 10 miles wide the Sanctuary has an area of approximately 170 square miles which is under the supervision of a Ranger, with twelve watchers under his control. The area is further protected on three sides by Reserved Forests patrolled by game watchers.

Having been furnished with letters of introduction to the President and to the Honorary Secretary of the Ceylon Game and Fauna Protection Society, also to Mr A.C.Tutein-Nolthenius, F.Z.S., of the Executive Committee, by our late Honorary Secretary Sir Reginald Spence, it was under very favourable auspices that the visit was made.

On the evening of the 9th February 1933 we all met together at the Tissamaharama Rest House, the party of five including Mr. A. R. Hughes, ornithologist and expert amateur photographer. The care with which all Rest Houses in Ceylon are provided with a mosquito-proof room and a full supply of mosquito curtains was much appreciated, for we all enjoyed a good night's rest undisturbed by the singing whine of the myriads of these pests for which Tissa is famed.

On our way through the Palatupane Reserve on the following day the country was verdant from the recent unusually prolonged monsoon rains; many pretty wild flowers bordered the paths; and the sweet scent of flowering shrubs and creepers was in the air. A skylark enchanted us with his aërial song so reminiscent of the home land; in and around the open sheets of water were a number of birds—redshanks, sandpipers, stints, godwits, golden-plover, cattle egrets, terns, painted storks, and many others. Green bee-eaters hawked the air 'chasing the purple butterflies', a pied crested cuckoo was seen jumping after insects in the grass; while kites and hawks circled in the clear blue sky. All nature seemed to smile in approval of our peaceful mission.

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A few miles beyond the Palatupane Rest House we emerged into a large open space in the centre of which was a pool of water. The scene was reminiscent of an African game country. Buffalo and spotted deer lay peacefully about or grazed on the short herbage; sambur rested or fed along the edge of the forest; sounders of wild pig rooted in the grass; and some jackals were observed returning from a drink at the pool.

These jackals were fine dark-coloured animals, seemingly larger and more handsome than the Indian species. There are no wild dogs in Ceylon. Jackals have been seen hunting in packs to pull down the smaller deer, but now the animals took no notice of them.

Other similar scenes were observed further on—good augury for what we would enjoy in the Sanctuary—and as the sun sank behind the sand-hills separating us from the sea, we arrived at the Yala Ranger's Bungalow on the bank of the Menik Ganga. Soon the full moon soared above the trees on the further side to flood our camp with its welcome light; a sambur hind voiced her alarm at the scent of a prowling leopard; the nasal croaking of the barbets was unceasing.

We looked apprehensively upon the turbid flood of the river rolling toward the sea and wondered whether the carts could make the crossing in the morning. All of us, men and cattle alike, had earned a night's rest after the long march of some twenty-six miles, and lulled by the ceaseless surge of the waves upon the shore were soon soundly sleeping.

The camp was early astir as the crossing of the river might be a lengthy business, and there would be twelve miles of mostly sandy track before tents could be pitched.

The ford is about half a mile up stream. One of the game watchers entered the water, found the end of the wire hawser broken by some tree trunk hurled down the river in a recent flood. Gaining the further bank he quickly procured a length of liana, strong as any hawser, to make the necessary connection to the other side. It was a relief to see that the depth would not prevent the passage of the carts.

We all stripped and crossed to watch the baggage being carried over on the men's heads. Then the empty carts were driven down the steep bank to be hauled through the strong stream by the diminutive bullocks sometimes swimming and sometimes wading and all the time encouraged by much noise as is the custom in the East. Safely across, the seven carts were soon again plodding along beneath the shade of the fringe of tall evergreen trees bordering the river banks to emerge under a hot sun into the more or less open country which was our first view of the Sanctuary, and through which the cart track leads to Pahala Potana.

Roaming about in advance of the carts, I failed to get a snapshot of a bull buffalo in a wallow; but by careful stalking managed to photograph a small herd feeding close to a reedy pool, obtaining a second 'shot' as they moved off.

The open spaces were alive with parties of buffalo, while all along the fringe of the jungle were groups of spotted deer. The

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animals merely moved quietly away on the appearance of the long string of carts and men; but only with a telephoto lens would it have been possible to obtain effective pictures. We hoped that those taken by Hughes would prove successful.

The heat was considerable, and as the day drew to a close these spaces would be covered with animals. Pig we saw, and signs of elephant; the sambur were all in the shade of the trees along the sand dunes, the area in the Sanctuary to which many of them are particularly partial.

At the place where we stopped for lunch was the skull of a long-defunct elephant which afforded a seat, and by the side of the path were the leg bones which had been used as a fire-place. During the wanderings in these jungles the remains of four elephants were seen, but of buffalo and other animals no bones were found.

It was when the shadows were fast lengthening that we neared the camping ground. Many herds of spotted deer scattered before the rumbling carts, and on emerging from the forest we gazed in astonishment at the scene before us. All about the plain, through the mile-long length of which meanders a running stream, were scattered herds of buffalo; along the further side were large herds and parties of spotted deer numbering perhaps seven hundred, while within the fringes of the forest were more animals. Probably there were a thousand deer, but the failing light prevented a more accurate computation. Sounders of pig wandered about, the tiny porkers scuttling to and fro, fencing with one another on their hind legs, and generally behaving like playful puppies; jackals roamed unconcernedly among the beasts whose bones they would some day pick when they fell victims to leopards or disease, for in Ceylon there are no vultures to dispute the feast.

It was only the centre part of the long plain which was in view as the ends curled out of sight. It was realized that the stock of game is very abundant, and this was confirmed by similar sights observed by the Government Agent, and other members of the party, who went further east on the following day to Uda Gajabawa and other open spaces. Everywhere roamed herds of buffalo and deer.

The night passed quietly. There were no alarm calls of sambur or spotted deer, no trumpetings of elephant, yet leopard and elephant must have been in the vicinity. The hours of darkness seemed to brood and be expectant, for one peoples the night with one's fancies. Lying awake I called to mind many forest vigils when the quiet of the jungle had sunk to night's absolute stillness and the ear was cocked to hear the sound of heavy footsteps. I could picture the deer moving fearfully, peering, sniffing, treading delicately lest a twig should snap, a branch rustle, ears moving to catch every little sound. Later in the night there would be absolute stillness, but in the early hours there is always the noise of little things on the prowl; quick stealthy noises, little rustlings and patterings, little sudden pouncings. Ah! the delight of those forest vigils! And so came dreamless sleep.

It was most interesting the next morning to see the cameras

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set for flashlight pictures, and I learnt from Hughes much of this fascinating pursuit. On our way to find a suitable 'run' a fine leopard was seen lapping at a pool. Buffalo and deer stared, but little perturbed by the unwonted sight of human beings. Were the Sanctuary more accessible to visitors— as it will be some day when it is a National Park—the animals would be less timid, for with familiarity would come the confidence born of the knowledge that man is not an enemy.

On our way back to camp a fine bull was spied in his wallow in the open plain. Stooping low and stepping warily in light rubber shoes I got to within fifteen feet of the recumbent form. He was not asleep, but did not hear the slight click of the shutter. The film wound off ready for another 'shot', a small piece of mud roused the old fellow from his siesta. Up he got with astounding agility for so bulky an animal and was twenty yards away in a second. Then he wheeled around to stare at the intruder and afforded a second 'shot'. Now Hughes advanced on him to take his picture with the telephoto lens, but even then he only walked slowly off to stand disgruntled with the stolid bovine stare of his species. On return to camp one of the servants, hearing the story related, enquired, 'Did he come to bite you?' at which there was much amusement.

In the open plain were two big bulls who appeared to have fixed a bend in the stream as the dividing line of each other's territory. One of them had his left horn broken off about a foot from the tip, no doubt in one of the terrific battles they have from time to time. They appeared to be surly brutes, and the Ranger begged me not to try and take a close 'shot', so I left them alone.

In the evening another camera was set for flashlight, and on return of the Government Agent at sunset we heard of all that had been observed towards the eastern boundary. Tutein-Nolthenius, keen naturalist and expert collector of the smaller mammals, related much that was of interest concerning the fauna of Ceylon. Recently he had obtained most rare and interesting specimens of wild cats in the coastal area near Hambantota.

As the shades of evening deepened animals began to come into the open, but not in such numbers as were seen on our arrival. No doubt the sight of the tents, the voices of the camp, and the light of the fires had scared the beasts accustomed to solitude. Watching with field-glasses, until the darkness descended and night stretched its smooth veil over the magic scene, it could be observed that more and more shadowy forms were advancing into the open. The buffaloes loomed as large as elephants.

It was dark now and the sky unclouded, but soon the round disc of the moon appeared, the trees threw queer shadows, and the camp fires blazing up spouted arrows of gold and scarlet against the dark background of the forest.

When living close to Nature one is early awake. The gentle wind that ushers in the dawn of day came scent-laden with the freshness of the blossoming forest trees and the camp was quickly astir. On this, the last day of our stay, three of us were to go to a small range of hills some five miles to the north, while Messrs.

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Brown and Hughes stayed to attend to camera work and complete the list of birds observed in the Sanctuary, which is appended to this article.

That expedition through the forest has unforgettable memories. Of all the party—which included the Ranger and four of his watchers—none had been there, and it seems that no one has visited those hills for many years.

About a mile from camp we came upon the Nabbadagas Wewa, a reed-bordered tank in which grow a number of thorn and other trees. Here was a colony of snowy white egrets, while in and around this jungle lake were many species of birds: a paradise this for the ornithologist and the wild life photographer for here we saw sambur and spotted deer, and all the animals of the Sanctuary visit the place.

Proceeding on our way a herd of spotted deer afforded a photograph; then a fine bull buffalo, stalked to within fifteen feet, was alarmed by some movement of one of the party peering behind to see the fun and away in that unexpectedly rapid manner before his picture could be taken; for it is not easy to retain such quick-moving objects in the small view-finder.

More buffalo were seen, also pig and deer, and a cow elephant moved quickly across an open space. I was just too late to 'shoot' her before she gained the shade of a tree, so we all sat down and watched, not twenty yards away, secure from detection as the steady wind was in our favour. A herd was somewhere about but time did not permit of delay so its picture is not with me.

More animals we met, and a leopard was seen by one of the men. Then came the struggle up the steep hillside through the weeds and undergrowth and the finding of a game track to take us to the summit of Mandagala, as the hill is called. The highest point is 523 feet above sea level and on it is a cairn of stones erected by the Survey Department.

Seated on the top of the hill we had a grand view of all the Sanctuary. The long plain of Pahala Potana, the line of the sea coast, the Little Basses light-house, a great passenger liner bound for Colombo, the trees marking the course of the Kumbukkan-oya to the east, the darker greenery marking the extensive but now empty bed of the Mandagala tank just below the hill, and the similar indication to the west of the Athurumithuru Wewa the drainage from which forms the streams which run to the Pahala Potana; all these we saw, and also a few small open spaces in which were buffalo in their wallows and sambur and deer in the shade of trees.

One's thought naturally turned to the needs of the Sanctuary. These will be ably set out in the Official Report of the Government Agent but can be confidently anticipated to include:—an improvement to the water supply of the area by repair of such tank embankments as can be carried out; the opening up of the country by means of 'rides', after the manner of fire lines of Indian forests, to facilitate proper watching and inspection; the clearing of more open spaces to improve the grazing.

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The thirty-six years of protection has evidently permitted the animals to greatly increase, and now they ask for more grazing and more water so that they can spread more widely through the forests. The photographs taken show how poor in condition are the buffalo in comparison to the wild animals of the Central Provinces of India, and this at a season when they have had the fortune of a North-East Monsoon far in excess of the average and extended much beyond the usual date. In this, the dry zone, where the rainfall is but 20 to 50 inches, the animals must suffer much during the hot months from overcrowding at the water pools.

Reluctantly we made our way down the hill to retrace our steps to camp. All the time we saw animals, and close to the egret pond there was a crocodile basking on the grass. He wasn't as fast asleep as he seemed, for he made off just as he had been satisfactorily posed in the view-finder. The two surly buffaloes were still eyeing one another; a fine bull was making affectionate demonstrations to a ponderous spouse at the lower end of the plain; a large snake swished away in the grass; and then, wading through the warm waters of the stream, we arrived at camp as the declining sun turned the leaves of the trees into glowing copper. So ended a glorious day and we slept wrapped in the mystery of the tropic night.

When leaving the camp next day on our return journey, a herd of some twenty elephants was close to the path. The cover was too thick to admit of an attempt at photography so two of our party crept quite close to see the shadowy forms of big mothers and small calves. Further on many deer were viewed, and an elephant hurried to cover on the approach of the carts to the lake and open space of Uda Potana. It was sad to know that all the water we were seeing would be soon dried up, and the herds forced to congregate along the banks of the river the waters of which would have dwindled to scattered pools.

The crossing of the Menik Ganga presented no difficulty. Then came lunch and a bathe and so to camp, where the buffalo grazed unconcerned a couple of hundred yards away.

The morning of the 15th February I set out in company with Mr. Brown to work through the jungle and see the Elephant Rock, that conspicuous landmark so well known to many Ceylon sportsmen, and with this further insight into the forests of Ceylon my most interesting visit came to an end.

With all the memories of those five days, followed by three days at the Wirawila Bird Sanctuary in the charming company of Mr. Charles Northway, renowned elephant hunter and sportsman (since deceased and greatly regretted by all who knew him), and our expert ornithologist Mr. Hughes who drove me the 167 miles to Colombo along the picturesque coast road, there is a deep debt of gratitude to all those who made the visit possible and so enjoyable in every way.

I have had the good fortune to see a number of game preserves and sanctuaries. The Pidoung Sanctuary in Upper Burma; the wonderful herds of swamp deer in the Kheri forests of Oudh; the Sanctuary in the Orrcha State where you may almost stroke the

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noses of the sambur; that now unique herd of some 5,000 antelope in the Punjab; the hundreds of Urial in the preserve of a Punjab Landowner; the elephant and bison around the Peryar Lake in Travancore; but nowhere have I seen so much varied wild life in its natural state as in the Yala Sanctuary.

I shall live in hope of an opportunity to again see, not the Yala Sanctuary, but the YALA NATIONAL PARK renowned through the East for the wonders of the Wild Life it contains.

Since the above was written some commencement has been made as to clearing inspection paths, but without an allotment of funds by the Ceylon Government the increased grazing and water which the herds require cannot be provided and the unfortunate animals must inevitably greatly suffer during those blazing months when the whole country is parched and dry. It is not difficult to picture to oneself the terrible sufferings of the thronging herds—insufficient water, no grazing; horrible.

For thirty-six years the Yala Sanctuary animals have multiplied in peaceful security and it is now the obvious duty of the Government to allot funds for the conservation of the poor beasts which, in the absence of speedy action, had better have been left to the more tender mercies of the meat poachers and the purveyors of hides!

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THE VERNAY SCIENTIFIC SURVEY OF THE EASTERN GHATS.

(Ornithological Section).

BY

Hugh Whistler, m.b.o.u., assisted by N. B. Kinnear, m.b.o.u.

Part XI.

(*Continued from page 763 of volume* xxxvii).

Dichoceros bicornis (Linnæus).

Buceros bicornis Linn., Syst. Nat., ed. x, vol. i (1758), p. 104—China *errore*, Travancore.

The Great Hornbill is not found on the eastern side of the Presidency. On the west it is well distributed. William Davison states that he found it not uncommon in the forests of the Wynaad, once seeing as many as 50 together in the cardamom forests of the Peria Ghat. On the slopes of the Nilgiris it is less common. Davison never saw it above Burliar; Jerdon says it occurs up to 5,000 ft. on the eastern slopes; and Mr. Betts tells me that the only one he saw was at 4,500 ft. in the Ochterlony Valley.

Kinloch considered it very common in the Nelliampathies. Fairbank does not seem to have met it in the Palnis but Terry found one in the Pittur Valley.

The Great Hornbill occurs, according to Bourdillon, throughout the whole range in Travancore, a pair or so being found in every glen or valley of any size, the bird being numerous nowhere except perhaps in some of the wilder jungles on the lower slopes of the hills. Here the breeding season is said (Stuart Baker, *Nidification*, iii, 430) to be in February, March and April. According to Bourdillon (*N. & E.*, iii, 70) the old birds pair in January and the young first show themselves in May, shortly before the rains of the S.-W. Monsoon commence.

As no specimens of this and the next species were obtained by the Survey I have not attempted to check their systematic status or possible races.

Hydrocissa coronata (Boddaert).

Buceros coronatus Boddaert, Tabl. Pl. Enlum. (1783), p. 53, based on Pl. Enlum., pl. 873—Philippines *errore*—Malabar.

The Malabar Pied Hornbill was not observed by the Survey and on the eastern side of the Presidency it is only recorded as occurring at Gumsoor in Ganjam (Jerdon, *B. of I.*, i, 246) on the southern boundary of its range in the Chota Nagpur area.

On the west it occurs, according to William Davison, in the evergreen forests of the Wynaad and on the lower slopes of the Nilgiris. Kinloch says that it is very common in the Nelliampathies. In Travancore, according to Ferguson, it is by no means common and is locally distributed in forest land about the foot of the hills.

The breeding season in the Presidency is not recorded.

Tockus birostris (Scopoli).

Buceros birostris Scopoli, Del. Flor. et Faun. Insubr., vol. ii (1786), p. 87 —Coromandel.

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Specimens collected:—252 ♂ 19-5-29 Shevaroy Hills 4,000 ft.; 289 ♀ 29-5-29 Chitteri Range 2,000 ft.; 732 ♂ imm. 22-8-29 Palkonda Hills 1,000 ft.

Measurements:—

	Bill.[1]	Wing.	Tail.	Tarsus.
♂ ad.	104	209	254	42 mm.
♂ imm.	84	204	246	44 mm.
♀	97	203	252	42.5 mm.

The Common Grey Hornbill has not been recorded in the Presidency north of the Palkonda Hills where the above specimen was obtained by the Survey. Captain Bates informs me that, though he has never seen it in the vicinity of Madras in spite of the well-wooded character of the country, it occurs commonly in the hilly country between Ranipet and Chittoor. There is a specimen from Udayagiri in the Madras Museum.

In Salem District, LaPersonne reports that it was not common in the Shevaroys at 4,000 ft. and that isolated pairs were met in the forest tracts of the Chitteri range. At Kurumbapatti it was fairly common.

On the western side there are only two records. A male, now in the British Museum, was obtained on the Coonoor Ghat by Wardlaw Ramsay on 12 September 1876 and Fairbank obtained a specimen in the avenues of the town of Palni in October 1876.

This species has no races.

Tockus griseus (Latham).

Buceros griseus Latham, Index Orn., vol. i (1790), p. 147—New Holland *errore*—Malabar.

In the Presidency, the Malabar Grey Hornbill is confined to the western side. There, according to William Davison, it occurs throughout the Wynaad and all about the base of the hills though it does not ascend their slopes. In the Nelliampathies it is very common (Kinloch). Fairbank records (*S.F.*, v, 395) that he obtained a specimen from a flock at the eastern base of the Palnis in 1867 though he seemed afterwards to have some doubt about the correctness of his identification. In Travancore, Bourdillon says (*S.F.*, iv, 387) that it is common in heavy jungle from 1,000 ft. to 3,000 ft., but Ferguson says that it is commonest at about 3,000 ft. especially on the Cardamom Hills. The latter shot it as high as 5,000 ft. on the High Range and at 4,000 ft. on Chimunji. In *Nidification*, iii, p. 441, however, Bourdillon is quoted as saying that it is more common below than above 2,000 ft. and actually sometimes occurs and breeds in the plains. The breeding season is said (*loc. cit.*) to be from January to early April, most eggs being laid in February.

Tockus gingalensis Shaw of Ceylon is very close to the Malabar Grey Hornbill, but may perhaps be considered to have attained the rank of a full species.

Upupa epops ceylonensis Reichenbach.

Upupa ceylonensis Reichenbach, Handb. Spec. Orn., Scans. (1851), p. 320—Ceylon.

Specimens collected:—533 ♂ 8-7-29 Vyampatti, Trichinopoly; 573 ♀ 21-7-29 Gingee; 1018 ♂ 19-11-29 Nallamalai Range 2,500 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	58.5-60.5	132-132.5	92.5-95	21-21.5 mm.
1 ♀	46	126	87	18.5 mm.

There is little on record about the status of the Hoopoe on the eastern side of the Presidency. With the exception of the above specimens and Mr. LaPersonne's note that in Salem District it ascends the hills to 4,000 ft. and is common on the Chitteri Plateau as well as in the open forests round Tirthamalai, we only know that it is common round Madras (Dewar).

[1] From base of casque to tip of bill in a straight line.

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In Coorg, Mr. Betts considers it uncommon, to be seen occasionally in the cold weather on dry open maidans. William Davison says that it is a not uncommon resident in the Wynaad and on the Nilgiris and their slopes.

Kinloch says that it is uncommon on the Nelliampathies, but may be found in pairs in certain favoured localities. In the Palnis it is generally distributed.

In Travancore, according to Ferguson, it is most common in the drier regions of the south in the low country. He adds that during the hot weather about March it may be found in the hills, even ascending the High Range.

The breeding season in the Nilgiris is said to be in April and May (Cockburn and Davison, *N. & E.*, ii, 334), but Major Phythian-Adams considers that it nests chiefly in February (*Birds of S. India*, p. 188).

All the Hoopoes that I have examined from the Presidency undoubtedly belong to the richly coloured form which is found in Ceylon. This is a small bird. Six specimens from Ceylon (♂ ♀) have wings measuring 120.5-134 mm., and Presidency specimens measure:—11 ♂ wings 131.5-138.5 mm., 5 ♀ wings 123-130 mm. This race Mr. Stuart Baker (*New Fauna*, iv, 312) considers to extend up to about the Deccan and the Bombay Presidency, intergrading on a line roughly about the latitude of Khandesh with a paler and larger race *E. c. orientalis*. This however does not agree with the results of my examination of the group. I can see no constant difference in colour in the resident Hoopoes anywhere from Cape Comorin up to Futtehgarh and Etawah in the Western United Provinces and two birds labelled Naini Tal (but perhaps from the terai below) in the Hume Collection also agree with them. As to size sixteen specimens from Futtehgarh and Etawah in the British Museum measure 119-140 mm., the sexed birds being as follows:—

6 ♂ wings 131-140 mm., 5 ♀ wings 119-132 mm.

In the Punjab grading into the typical race begins. Punjab breeding birds are pale in colour, approaching the typical race, and in size they are small approaching *ceylonensis*. The wings of 5 males in my collection measure 133-143.5 mm., of 3 females 128-130 mm. For this intermediate race—if it is worth recognition—we may use Stuart Baker's name *Upupa epops orientalis* [*Bull., B.O.C.*, xlii (29 November 1921), p. 29] which is merely a new name without description for *Upupa indica* Reichenbach (*Handb. Spec. Orn., Scans.* (1853), p. 320—India). This name I now restrict to Ambala, as Stuart Baker evidently had in mind (*New Fauna*, vol. iv, p. 311). His measurements (wing 128-160 mm., average 135 mm., practically all sexed males have a wing of over 150 mm.) are far too large whether for his or my use of the name and must be due to confusion with immigrants of the typical race. I accept Madame Koslov's view (*Ibis* 1932, p. 589) that *Upupa epops saturata* is not a good race.

[Upupa epops epops Linnæus.

Upupa epops Linnaeus, Syst. Nat., ed. x, vol. i (1758), p. 117—Europe, restricted to Sweden.

Although I have examined no Hoopoe from the Presidency which can be attributed to the typical race there can be little doubt that it occurs as a winter visitor. Ball records it from Jeypore (*S.F.*, vii, 209) and Fairbank definitely states (*S.F.*, v, 399) that he shot a specimen in the Palnis. It has in any case been obtained just on our borders for two specimens were collected by Mr. Salim Ali during the Hyderabad Survey at Paloncha 300 ft. on 21 November 1931.]

Harpactes fasciatus malabaricus (Gould).

Trogon malabaricus Gould, P.Z.S., 1834 (June 9), p. 26—Malabar Coast.

No specimens of the Malabar Trogon were procured by the Survey though Mr. LaPersonne reports that a pair were seen at Sankrametta at 4,000 ft. It had already been reported in this area by Ball who states that he met it on two occasions at Jeypore (*S.F.*, v, 413). Blanford obtained a male north of Ellore on 7 April 1871 and this specimen is in the British Museum.

In the west of the Presidency it is much better known. A pair from Calicut are in the Hume Collection. William Davison says that this Trogon, though nowhere abundant, occurs all through the Wynaad and up the slopes of the Nilgiris to at least 6,500 ft. He observed it in the forests of the Droog, at Coonoor, at Pykarra and Neddivattum. Phythian-Adams (*Birds of S. India,*

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p. 190) considers it distinctly uncommon in the Nilgiris, remarking that in the past three years he had only seen one, at Madumalai at 3,000 ft.

Kinloch considered it common in the Nelliampathies. Fairbank met with three in his visit to the Palnis and secured a female at Vengayam (east base) on 28th May and a male at Shemiganur 5,000 ft. in June (*S.F.*, v, 393). The latter is in the British Museum.

In Travancore the Trogon is said to be not uncommon at heights above 1,000 ft. in heavy jungle. A nest with two slightly incubated eggs was obtained by Bourdillon on 22 March 1878 and is described in *S.F.*, vii, p. 172. The breeding season in Travancore is said to extend from February to May (Stuart Baker, *Nidification*, iii, p. 448).

I have not been able to examine any specimens of this Trogon from the Chota Nagpur-Vizagapatam area to verify this subspecific agreement with birds from the Malabar Coast. The typical race from Ceylon is distinctly smaller though the difference in colour is not very marked except in the female. The *New Fauna* does not make it quite clear how far north the Malabar race extends. Although James Davidson does not include it in his list of species from Western Khandesh (*S.F.*, x) there are specimens from Khandesh in both the Tweeddale and Hume Collections and after the date of his list Davidson himself procured a male (now in the British Museum) on 25 April 1886 in the Dangs, Khandesh. Three of these Khandesh specimens are markedly paler than Malabar birds but I am not yet satisfied that the difference is subspecific.

Micropus melba bakeri (Hartert).

Apus melba bakeri Hartert, Nov. Zool., vol. xxxiv (1928), p. 363—Catton Estate, Ceylon.

No specimen of the Alpine Swift was procured or reported by the Survey. It is very difficult to unravel the meaning of the movements of this Swift as we have no accurate conception of the distances it may fly during the day from its roosting places. These may well be very great. There is a well known roosting place—and probably also breeding place—in the cliffs of the great waterfall at Gairsoppa in North Kanara, described by Jerdon (*B. of I.*, i, 176) and by James Davidson (*J.B.N.H.S.*, xii, 47). Here vast numbers arrive nightly and Vidal (*S.F.*, ix, p. 43) suggests, with the greatest probability in my opinion, that this is the roosting place to which the numbers he saw flying southwards every evening in the South Konkan were bound, to which stream are also probably added the birds that pass over Belgaum (Butler, *S.F.*, ix, 379). This roost doubtless draws the birds also from the south as Jerdon remarks that at Tellicherry he frequently saw the birds flying southwards early in the mornings.

All the Presidency birds do not however come from Gairsoppa. H. R. P. Carter saw parties flying from S.-E. to N.-W. near Coimbatore in the early morning of 5 October (*S.F.*, i, 474). William Davison (*S.F.*, x, 347) says that there is apparently a permanent colony at St. Catherine's Falls at Kotagherry[1] and a few are generally to be seen at the falls at Kartary (Karteri) and Pykarra. Terry also suggests that there is a roosting or breeding place on one of the cliffs near Pittur in the Palnis (*S.F.*, x, 469). It is not clear why Kinloch suggests that it is only common during the cold weather on the Nelliampathies, and Ferguson's statement that Alpine Swifts are to be seen in numbers at grass fires on the High Range of Travancore is very inadequate.

Jerdon says that occurring all along the line of the Western Ghats down to Cape Comorin, being at times very abundant on the Nilgiris, this Swift extends its daily flights often to the western seacoast and occasionally eastwards to Salem, Madura and even Madras. He adds that on several occasions he saw large flocks flying eastwards towards the sea from the rocky hills near Madura about sunset. On another occasion he saw an enormous flock flying eastwards from the same range a little south of Madura. The eastward movement at sunset suggests that the big colonies in Ceylon mentioned by Legge and more recently by W. W. A. Phillips (*Ceylon Jour. Science*, Section B, vol. xviii, p. 252) supply their quota of daily visitors to the Presidency.

The small number of Presidency specimens available for examination all belong to the small form separated by Hartert. Eleven specimens from the

[1] According to Mr. Salim Ali who investigated the neighbourhood in 1932, this colony has now disappeared—Eds.

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Presidency and Ceylon measure: bill 16-17.5 mm., wing 193-213 mm., tail 70-78.5 mm. as compared with a series from Europe and Upper India wing 206-224.5 mm., tail 68-87 mm. In colour they tend to be darker. The two specimens from Ceylon in the British Museum are very dark indeed, being very close in colour to *M. a. africana*, though this latter usually has the white parts black shafted. The Presidency birds vary in colour and some are no darker than birds from Northern India, but no doubt sun and air pressure bleach the plumage very rapidly. I have at any rate seen no specimens that I could unhesitatingly refer to the typical form south of Belgaum and Raipur.

In *Nidification*, iii, 452 Mr. Stuart Baker can only record reputed breeding places of the Alpine Swift in India. It is well to emphasise therefore that James Davidson took a half-feathered chick, now in the British Museum, at Saptashring, Nassik, on 11 April 1887, while Rattray caught a young bird at a nest near Dunga Gali (*J.B.N.H.S.*, xvi, p. 660).

[Micropus pacificus leuconyx (Blyth).

Cypselus leuconyx Blyth, J.A.S.B., vol. xiv (after July), 1845, p. 212—Deccan.

Jerdon states that he obtained a specimen of the White-rumped Swift in the western part of the Deccan and several in Malabar (*B. of I.*, vol. i, p. 180). This record was viewed with some suspicion in both the *Old* and *New Faunas*, but there seems no reason to discredit it in view of John Davidson's experience of its abundance along the coast in North Kanara (*J.B.N.H.S.*, xii, p. 47). It is therefore not unlikely to visit the Presidency and Baker and Inglis (*Birds of S. India*, p. 192), indeed, state that it occurs in the Nilgiris where it may sometimes be seen in company with *M. affinis* and *M. melba*. It should not however be definitely admitted to the Presidency list until specimens have been procured for proper identification.]

Micropus affinis affinis (Gray).

Cypselus affinis Gray, Illustr. Ind. Zool., vol. i (March 1830), pl. 35, fig. 2—Ganges.

Specimens collected:—589 ♂ 23-7-29 Gingee; 811 ♂ 12-9-29, 819 ♀ 27-9-29 Kodur; 872 ♂ 3-10-29 Seschachalam Hills 2,000 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
3 ♂	8-10	122-125.5	39-40.5	9 mm.
1 ♀	8.5	123	37.5	— mm.

The Common Indian Swift has not been recorded in the Presidency from anywhere north of the Krishna River. South of that it occurs at Bellary where Captain Horace Terry wrote about a possible connection between its breeding habits and the rains in June and later (*N. & E.*, iii, 23). The above Survey specimens and Dewar's remark that it is not very frequently seen at Madras complete the records for the eastern side.

In Coorg, according to Betts, it is fairly common but its numbers vary greatly. One day it may be seen in large flocks and then it disappears for several weeks. It apparently does not breed in Coorg.

William Davison records (*S.F.*, x, 347) that he saw it at Ootacamund on several occasions in January as also Baker (*Birds of S. India*, p. 192). Betts informs me that in his experience it is not common in the Nilgiris though flocks may be seen occasionally along the edge of the Ghat, especially in the evening.

In the Nelliampathies Kinloch only found it on the Lily downs where it was fairly common (*J.B.N.H.S.*, xxix, 565).

As regards the Palnis, Fairbank tells us that he saw a dozen hawking at 3,000 ft. Terry, however, found it not uncommon at Pittur and Kukal.

In Travancore Ferguson says that he did not meet it himself though his collectors found a colony breeding in January 1903 in the Registrar's office in N. Parur.

The only breeding records for the Presidency are mentioned above and here, as in many other parts of India, there is considerable difficulty in understanding the status of this Swift.

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There are few birds which have given more trouble to the taxonomist than this Swift. The questions of the identity of Indian and African birds and of the division of Indian birds into races have been discussed on many occasions. Unfortunately the Survey did not profit by the chance of obtaining a good series in the south from whence birds are most needed.

In the *New Fauna* (vol. iv, pp. 332-335) Stuart Baker divides Indian birds as follows (the wording of the distributions is his):—

Micropus affinis galilejensis—Sind and portions of North-West Provinces.

M. a. affinis—North-West Provinces except along the Afghan and Baluchistan boundaries: Punjab, United Provinces, Bihar, extreme Western Bengal, south to Belgaum, Rajputana, Deccan and Central Provinces.

M. a. nipalensis—Nepal, east to Kamrup in Assam and Bhutan; Bengal, Duars, Orissa to Madras; South Deccan, Southern Bombay Presidency from a little south of Belgaum, Mysore and Travancore.

M. a. subfurcatus—Assam; Chittagong and Comilla in Eastern Bengal, Manipur.

This division is certainly not satisfactory as a whole.

M. a. affinis and *M. a. subfurcatus* are of course two perfectly good and recognisable races and they were in fact regarded as two species in the *Old Fauna* (vol. iii, pp. 168-170). *M. a. subfurcatus* differs from the typical race in having the head, nape, wings and tail and the tail-coverts blacker so that there is less contrast between them and the mantle and back. The tail is longer and distinctly subfurcate.

M. a. galilejensis (type-locality Galilee, Palestine) is very similar to *M. a. affinis* in that the tail is short and there is a distinct contrast between the head and nape and the mantle. It is merely a paler and larger form of it. The palest parts of the head, namely the forehead and a short connected superciliary streak, may become almost white. Wing 132-137.5 mm., tail 40-45.5 mm.

This form is however only recognisable if a series of Palestine birds is compared with a series of South or Central Indian birds. Individual specimens cannot always be recognised and I certainly cannot find any value in attempting to maintain a distinguishable distribution of *M. a. galilejensis* in N.-W. India.

A series from the Punjab in Mr. Waite's and my own collections measures:—

	Wing.	Tail.
9 ♂	125-133.5	39-44
13 ♀	127.5-132.5	38-43

This series is quite indistinguishable in colour from the Survey series and other birds from Central and Southern India. It is however slightly larger. Mr. Bannerman (*Ibis* 1932, p. 687) measures 22 examples of *affinis* as having wings 112-134 mm., seldom over 130 mm. In 11 examples of *affinis* measured from Bombay southwards—leaving aside the Survey series—I find a variation of wing 124-130.5 mm., tail 38-41.5 mm. except for one bird with a wing of 116 mm. We may accept the fact that a slight grading in size from north to south exists but it is not marked enough for racial recognition. Southern Indian birds are as much smaller than Northern Indian birds, as these latter are than true *galilejensis* from Palestine. They are as close in colour to North Indian birds as these latter are to true *galilejensis*. The intergradation between the three areas is complete and it is therefore as illogical in theory as it is in practice valueless to place the division between the two forms somewhere in N.-W. India instead of between Palestine and India. In my opinion *galilejensis* may be removed from the Indian list.

There remains the question of *M. a. nipalensis*. This form is the intermediate between *M. a. affinis* and *M. a. subfurcatus* both in colour and size (Nepal wing 127.5-133 mm., tail 44-48 mm.). It may be recognised if desired in this sense but I find no evidence whatever for including with it birds from Orissa, Deccan and the Madras and Bombay Presidencies, which in my opinion are quite indistinguishable from *M. a. affinis*.

Stuart Baker has however commented on the fact that birds from Ceylon are dark. This is correct. The three specimens in the British Museum are alike in having the head, tail and upper tail-coverts all practically black, almost the same colour as the mantle. In other words they agree in colour

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with *subfurcatus* rather than *affinis*, though they differ from the former in their smaller size (wing 128-132.5 mm., tail 42-43.5 mm.). They certainly cannot be included with *M. a. affinis*. It would be dogmatic to pronounce on their identity until a better series is available but the probability is that they are identical with the African *M. a. abessynicus*. The only two specimens which I have examined from Travancore agree with Ceylon birds rather than true *affinis*.

Cypsiurus parvus batassiensis (Griffith).

Cypselus balassiensis (error for *batassiensis*) Griffith in Cuvier's Animal Kingdom, vol. vii (*Aves*, vol. ii), 1829, p. 60—India, restricted to Calcutta.[1]

Specimens collected:—5-6 ♂♀ 9-4-29 Kurumbapatti; 1722 ♂ 23-4-30 Jeypore Agency 2,000 ft.

Measurements:—

	Bill.	Wing.	Central tail.	Outer tail.	Tarsus.
2 ♂	7.5-8.5	115-120	30.5-32	60-61	28-30.5 mm.
1 ♀	8	114.5	31	61	28 mm.

The Palm-Swift is doubtless generally distributed throughout the Presidency wherever the *Tad* Palm (*Borassus flabellifer*) is found. Where that may be I find but few details. Jerdon's statement that the Swift is common in the Northern Circars and Carnatic and Dewar's statement that it is very common at Madras furnish the only records for the eastern side in addition to the three Survey specimens.

On the west, Hume stated that he had received a specimen from Sultan's Battery, Wynaad (*S.F.*, x, 348). Fairbank observed it about *Tad* Palms in Periakulam near the eastern base of the Palnis. It is very abundant in South Travancore where its host palm takes the place of the cocoanut in the low country about Cape Comorin, extending in smaller numbers as far north as Trivandrum and Quilon. In this last area it is said to breed from February to June. It is evidently a strictly resident species.

Stuart Baker has divided the Palm-Swift into two Indian races, the typical race in his opinion occurring from Bengal and Upper Assam, through Orissa and Madras to Ceylon, whilst the rest of the Indian range (which as Ticehurst has pointed out, *J.B.N.H.S.*, xxxiv, 473, is more restricted than Stuart Baker realises) is given to a paler race *palmarum*. Specimens of this Swift are not numerous in collections and a large proportion are poor and greasy so that I have had great difficulty in assuring myself that this division is correct. One would hardly expect it. In the first place this Swift is so definitely a parasite[2] on the *Borassus* palm that its limited habitat and the restricted range of the palm in India, which is no doubt based on uniformity of certain ecological conditions, would hardly be expected to allow the formation of races. While, secondly, birds which have a very wide range outside India do not as a rule tend to break up into races in India. In my opinion we can only consider *batassiensis* and *infumatus* as races of the widely spread African Palm-Swift *Cypsiurus parvus*, which is also a parasite on certain palms and particularly on *Borassus flabellifer*.

Chaetura giganteus indicus Hume.

Chaetura indica Hume, Stray Feathers, vol. i (1873), p. 471—Andamans.[3]

The Brown-throated Spine-tail was not reported by the Survey. It is however very numerous in parts of the Presidency, though its movements are not easy to understand.

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[1] Stuart Baker, *New Fauna*, iv, 336.

[2] A slight misuse of this term may perhaps be forgiven. The Swift does not of course feed on the palm.

[3] For the use of the generic name *Chaetura* and not *Hirundapus* see Steinbacher Die Vögel der paläark. Fauna, Ergänzungsband Heft. iv, p. 356. The type-locality for *indica* was restricted to Aneichardi, Travancore by Stuart Baker (*J.B.N.H.S.*, xxviii, p. 322) but unnecessarily as Hume (*loc. cit*) clearly mentions the Andamans as his first locality.

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In Coorg it is not very common, according to Betts, being found in small parties. Jerdon says that he met with it very frequently in the Wynaad and at times on the seacoast of Malabar. Once, sometime after sunset he saw an enormous flock pass over the bungalow at Canote, about 14 miles from the coast at Tellicherry. They were flying nearly due west towards the sea (*B. of I.*, i, 172). He first met with it at the foot of the Nilgiris near Metapolliam and again at Goodalore on the western side of the hills. Vipan (*S.F.*, i, 496) reports that he shot it on the Coonoor Ghat. William Davison (*S.F.*, x, 347) is more detailed. On the Nilgiris and their slopes, according to him, this Spine-tail occurs at odd intervals, in parties of 12 to 50 individuals. They generally arrive from the east and disappear westwards. This statement agrees with the experience of Mr. H. R. T. Carter at Coimbatore (*S.F.*, i, 474), who found that the Spine-tails were accustomed to pass over in a line from the Anamallais over the Palghat gap to the Nilgiris, travelling very fast. His account is too long to be quoted here and it is not altogether clear but he evidently considered that the passage was seasonal and apparently dependent on the S.-W. Monsoon. June, July and October are mentioned and birds collected in those months are in the British Museum.

In the Nelliampathies Kinloch says that this species is common in the cold weather. In spite of this statement and Mr. Carter's experiences I do not think that the bird is a migrant in the true sense and its spectacular movements are probably dependent on meteorological conditions. North Kanara is the northern limit of its recorded distribution in Southern India (*J.B.N.H.S.*, xii, 48), James Davidson considered it a resident and in Travancore, Bourdillon (*S.F.*, vii, p. 34) clearly says that it is abundant at all times of the year when the weather is fine and clear though during the early showers of April a flight of Swifts is a pretty sure indication of the approach of a storm. The breeding season in Travancore is almost confined to March and April (see Stewart, *J.B.N.H.S.*, xxii, p. 393 and *apud* Stuart Baker, *Nidification*, iii, pp. 465-467) and most nests are to be found at elevations between 1,000-2,000 ft. in thick forest. These Swifts roost in colonies in trees but the circumstances of their breeding in the base of hollow trees separates the pairs at that period.

Although largely confined to the rain forests of the western hills it is not surprising that this Swift travels to the east of the Presidency on occasion, as Carter mentions (*loc. cit.*) that he had seen it at Salem and further north Hume mentions specimens from Bangalore (*S.F.*, x, 347).

The statement in the *New Fauna* (iv, 343) and *Nidification* (iii, 465) that the northern limit of this Swift in Southern India is latitude 12° is of course a slip. It is common in North Kanara.

Indicapus sylvaticus (Blyth)

Acanthylis sylvatica Tickell, J.A.S.B., vol. xv (1846), p. 284—Central India —restricted to Maunbhum.

Not obtained by the Survey. Very little is known about the White-rumped Spine-tail in our area. William Davison met a party hawking about over a stream on 1st May in the Peria forests of the Wynaad and a specimen that he obtained on that occasion is in the British Museum. It has been recorded from Coonoor (*Old Fauna*, iii, 175) but it must have been only a straggler there as no one appears to have met it again in the Nilgiris. I cannot trace the authority for the statement in the *New Fauna* (iv, 345) that it occurs in the Palnis.

In Travancore this Spine-tail was apparently overlooked by the Bourdillons and Ferguson and it was first recorded by Mr. J. Stewart (*J.B.N.H.S.*, xxii, 394) who says 'breeds on the Travancore Hills in open forest at elevations of about 2,000 ft. It hawks about during the day in parties of about a dozen birds, but does not breed in colonies'. Mr. Stewart was also successful in obtaining nests and accounts of the breeding habits in Travancore will be found in the *New Fauna*, iv, 146 and *Nidification*, iii, 345. The breeding season is in March and April and Stewart obtained a few eggs in the first half of May.

There are no races of this bird in India and the very similar *Rhaphidura leucopygialis* (Blyth) can hardly be considered a race of it owing to the

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elongated upper tail-coverts, which are paralleled by *Chaetura sabini* of West Africa. Mention should however be made of the fact that *Chaetura thomensis* Hartert, restricted to the island of Sao Thomé in the Gulf of Guinea, would certainly pass on its characteristics as a race of our Indian bird. The genera of these Swifts are evidently in need of revision.

Collocalia fuciphaga unicolor (Jerdon).

Hirundo unicolor Jerdon, Madras Jour. Lit. Sci., vol. xi (1840), p. 238—Coonoor Pass.

Not procured by the Survey as in the Presidency it is confined to the western side. The Indian Edible Nest Swift is the commonest Swift on the western hills where it is evidently a resident. In Coorg according to Betts it is always present in large numbers. William Davison mentions it as very abundant in the Brahmagherries while Jerdon includes the Wynaad in its range. In the Nilgiris it is of course very well known, especially about Ootacamund. It must occur between all these hills and the coast as Jerdon has left an account of the breeding colony on Sacrifice Rock, 20 miles south of Tellicherry, which he visited in March 1849 (*N. & E.*, iii, 29).

It is found in large numbers in the Palnis, especially about the lake at Kodaikanal and Foulkes (*J.B.N.H.S.*, xv, 727) gives an interesting account of how these Swifts dip into the water as they fly, occasionally with sufficient violence to be upset and drowned.

It is similarly abundant on the hills of Travancore.

The breeding season is somewhat extended from March to June and we have more detailed accounts of the breeding of this Swift than of almost any bird in the Presidency. The chief references for it are *Stray Feathers*, iv, 374 (Bourdillon), *Nests and Eggs*, iii, 28-33 and *Nidification*, iii, 468.

Dr. Stresemann has devoted special attention to the difficult group of these Swiftlets and his latest conclusions will be found in *Bull. Raffles Museum*, No. 6, December 1931. I do not therefore propose to go into the affinities of this species in any detail. I should however like to remark that in my opinion it is quite incorrect to attribute the Himalayan and the South Indian forms to two different species. They are evidently two races of one species. In colour they are identical except that the Himalayan bird *C. f. brevirostris* (McClell.) is a shade darker and more glossy on the upper plumage and it is also slightly larger:—

		Wing.	Tail.
C. f. brevirostris	7 ♂	121-131.5	51.5-58 mm.
C. f. unicolor	6 ♂	113-117	47.5-54.5 mm.

It is commonly stated that *unicolor* has the tarsus naked and *brevirostris* feathered. If this is correct—and I am aware that Hume believed in it (*S.F.*, ix, 289 and xi, 33)—the difference is certainly not appreciable in skins and at best is so slight that no great importance need be attached to it. It is valueless for a key.

The reason for keeping *unicolor* as a separate species to *brevirostris* has no doubt been the belief that both forms occur in the Western Himalayas. This is based solely on a small series of *unicolor* in the British Museum, labelled Koteghar 1868. These skins are not very satisfactorily labelled and one of them has had Koteghar substituted for Etawah. It may be that Koteghar has somehow been confused with Kotagiri or the skins have been wrongly labelled for some other reason. At any rate I am personally quite satisfied that only one form of Swiftlet occurs in the Western Himalayas and it is undoubtedly *brevirostris*. This point should materially assist Dr. Stresemann's further studies of the group.

Attention may be directed to the remarkable development of the salivary glands in the breeding season, connected with the curious nesting habits.

Hemiprocne coronata (Tickell).

Hirundo coronata Tickell, J.A.S.B., vol. ii (November 1833), p. 580—Borabhum.

Specimens collected:—269 ♂ 23-5-29, 279 ♀ juv. 24-5-29 Shevaroy Hills;

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735 ♀ 23-8-29, 744 ♀ 24-8-29 Palkonda Hills 1,000 ft.; 1667-8 ♂♀ 6-4-30 Sankrametta 3,500 ft.; 1691 ♂ 17-4-30 Jeypore Agency 3,000 ft.

Measurements:—

	Bill.	Wing.	Central tail.	Outer tail.	Tarsus.
3 ♂	12-13	141-156	41-45.5	119-135.5	7-8.5 mm.
3 ♀	11	150.5-159.5	40.5-45	126.5	7-8 mm.

The Indian Crested Swift has not been recorded from the eastern side of the Presidency except for the above Survey specimens and Jerdon's remark that he had got it from the Nellore Ghats. It is not very common on the west either. Mr. Betts did not include it in his Coorg list, though he later informed me that a pair had been seen about some paddy fields on several occasions until the monsoon apparently drove them away. William Davison met them occasionally in the Wynaad but not in the Nilgiris. They occur there however as Jerdon says that they extend up to 4,000 ft. and Hume (*N. & E.*, iii, 36) mentions that he received eggs from the Nilgiris.

Kinloch found the Crested Swift in the Nelliampathies in the cold weather. In the Palnis Fairbank says he only met with a single immature specimen at the eastern base and this specimen (♂ juv. 25-6-1877) is now in the British Museum. Terry, however, considered it pretty common on the slopes of the Palnis and at Pulungi, and he obtained a single much incubated egg in the Pittur Valley on 7 April. The taking of this nest is described at length in *N. & E.*, iii, p. 37.

In Travancore Ferguson considered it by no means common, remarking merely that the museum contained a few specimens without locality and that he had only had one brought in by his collector.

Terry's nest furnishes the only breeding record for the Presidency and the bird's status does not appear very clear.

The Crested Swift has no races in India. Nothing is known about the meaning of the patch of silky downy feathers on the flank or of the curious decomposed edges to the tertiaries which in some specimens make a conspicuous patch.

Caprimulgus macrourus atripennis Jerdon.

Caprimulgus atripennis Jerdon, Illus. Ind. Orn. (March 1845), letter press, pl. 24—Eastern Ghats to west of Nellore.

Specimens collected:—335 ♀ 5-6-29, 439 ♀ 18-6-29 Chitteri Range 2,000 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♀	20-21.5	174.5-179	123.5-127	16-18.5 mm.

Very little is accurately known about this race of Horsfield's Nightjar in the Presidency. Jerdon obtained his type, which is still in the British Museum, from the Eastern Ghats, west of Nellore, and Roscoe Allen met with the species at Horsleykonda in April (*J.B.N.H.S.*, xviii, 905). LaPersonne reported some species of Nightjar to be very common throughout the district of Salem and the two specimens procured, one of which was killed from a nest with one egg, both belonged to this species.

In Travancore Ferguson only procured two specimens, both of which were shot on the High Range. Kinloch took a clutch of eggs in the Nelliampathies in February, according to Stuart Baker (*Nidification*, iii, 479), but the species is not included in Kinloch's published list of the birds of those hills and as on p. 482 Kinloch is also credited with having obtained the eggs of the large Northern race *C. m. albonotatus* in the same hills it is evident that these records require some confirmation.

Further north William Davison says that he only met with it at Manantoddy, Wynaad, and in that immediate neighbourhood and this record is verified by two skins in the British Museum. He adds that it does not seem to occur on the Coonoor, Neduvattum or Seegore side of the Nilgiris, but that it occurs below Kotaghery. A female obtained in the last locality by Miss Cockburn on 15 April 1871 is in the British Museum.

Nothing appears to be known accurately about the breeding season in the Presidency.

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Further northwards this race may be accepted as reaching to N. Kanara and the Godavery Valley. On the eastern side it gradually grades into the larger *albonotatus*.

In the *New Fauna* Mr. Stuart Baker accepts Ceylon birds as belonging to *C. m. atripennis*. This, however, does not appear to be correct. There is a good series of specimens from Ceylon in the British Museum and they are definitely darker in tone throughout the whole upper surface, this being particularly marked on the collar, which is chocolate as opposed to rufous brown, and on the tails.

The series from Java in the British Museum is very poor but so far as it goes I am unable to see any difference between Ceylonese and Javan birds and, therefore, attribute the former to the typical form, thus providing another example of the close connection between the Cinghalese and Malaysian faunas.

The only description[1] which I can find of the call of this race is by James Davidson (*J.B.N.H.S.*, xii, 50) who says it is an almost metallic cry of four notes. This would seem to be confirmed by Butler's remark (*J.B.N.H.S.*, xii, 423) that the Ceylon form has also a call which is 'invariably a low liquid chuckle of three or four notes'. But there may be some mistake as Legge says that the call of the Ceylon bird resembles the sound of striking an axe on a thin plank, a call which is very definitely known to belong to other races of this species.

It should be remarked that an important difference between birds from Northern India (*albonotatus*) and birds from Southern India (*atripennis*) and Ceylon (*macrourus*) appears to have been overlooked. In the first named the females have the tips of the outer tail feathers pale yellowish buff, so that they are easily distinguished from the male. In the other two races the tips are normally white as in the males.

Caprimulgus macrourus albonotatus Tickell.

Caprimulgus albonotatus Tickell, J.A.S.B., vol. ii (after December 1833), p. 580—Borabhum.

Specimen collected:—1771 ♂ 5-5-1930 Anantagiri 3,000 ft.

Measurements:—

Bill.	Wing.	Tail.	Tarsus.
22.5	210	169	20.5 mm.

This specimen provides the first record of this race of Horsfield's Nightjar in the Presidency and, according to LaPersonne, it was common throughout the hills of the Vizagapatam district. The testes were very greatly enlarged, so it is evident that the breeding season here includes May.

I am not able to follow Stuart Baker (*New Fauna*, iv, 364-365) in his division of this Nightjar in Northern India into two forms. Birds from the Eastern and Western Himalayas appear to me to be identical in colour and size and with them must be grouped the winter series from the United Provinces. They run only slightly larger than the small series of birds available from the Chota Nagpur area. These topotypical birds are in truth intermediates between the large pale birds of Northern India and the small dark *atripennis* of the south, but as they are far closer in size to and agree in colour with the northern birds they may well give their name to the whole area. I have seen no evidence for the extension of the range of this race, or indeed any race, to the Northern Bombay Presidency.

The note of Horsfield's Nightjar is well established. Long ago I wrote (*Ibis* 1926, 747) 'the call of this bird is a very loud resonant *chaunk* freely repeated, like the blows of an adze on a plank, or even the sound of felling a tree. It is audible a great distance away and when heard close at hand emits a great volume of sound. It is uttered from the bare branch of a tree.' B. B. Osmaston says 'its loud reverberating call *chounk chounk* . . . repeated any

[1] There has been and still is so much confusion over the calls of the various Indian Nightjars that it has seemed to me useful to summarise such accurate information that I can find on the call of each species.

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number of times from 1 to 50 . . . This call is repeated at the rate of 5 in 4 seconds' (*J.B.N.H.S.*, xxvii, 949). Mr. A. E. Jones considers it a rich double call note *chaunk-chaunk* which reverberates through the jungles. He confirms that the call is only given from a bush or tree (*J.B.N.H.S.*, xxix, 286).

Caprimulgus indicus indicus Latham.

Caprimulgus indicus Latham, Index Orn., vol. ii (1790), p. 588—India.

The Jungle Nightjar was not procured by the Survey and in the Presidency it is as yet only recorded from the western side except for Jerdon's statement that he procured it in the Carnatic.

In the Wynaad it occurs sparingly according to William Davison who considered it common on the Nilgiris. Here Jerdon says it occurs on the summits but Mr. Betts informs me that it occurs all over the hills. Kinloch is said to have taken eggs in the Nelliampathies (*Nidification*, iii, 484). Terry says that it is common in the Palnis, especially at Pulungi and Pittur; at the latter place their calling was a positive nuisance to the camp.

In Travancore it is common and Bourdillon considered it a winter visitor but Ferguson has corrected this. In his opinion it is a winter visitor to the lower slopes of the hills, apparently retiring about May to the High Range.

In the Nilgiris William Davison gives the breeding season as the latter end of February and the earlier part of March. At Kotaghery Miss Cockburn considered it February, March and April. In the Nelliampathies Kinloch's eggs were taken in February. In Travancore Bourdillon says it breeds from January to March.

There are two points on which I am unable to agree with Stuart Baker (*New Fauna*, vol. iv, pp. 366-369). First of all I cannot agree to the extension of the Ceylon race *C. c. kelaarti* to Southern Travancore. There are only three specimens from Ceylon in the British Museum and these may just be separable from the typical race on their smaller size (2 ♂ wing 174-180 mm., tail 126 mm.; 1 ♀ wing 174 mm., tail 116 mm.) and on having the tail darker with heavy barring, though a better series may prove that this distinction does not hold good. Travancore birds however—and of these I have examined quite a good series—do not appear to me to be separable from those throughout the rest of Peninsular India either in size, in the prevailing grey tint of the plumage, the finer streaking of the back or in the finer barring of the tail. There is of course a good deal of individual variation but as Hume showed long ago (*S.F.*, iv, 381 and vi, 56) it is not consistent with distribution.

Himalayan birds are, however, separable from those of the Peninsula. In a series the general tone of colouration is warmer and browner, the markings on the back are heavier and the barring of the tail is broader. Whilst not absolutely larger in a series, as individuals they tend to average larger.

These Himalayan birds Stuart Baker attributes to *Caprimulgus indicus jotaka* Temm. & Schl. (Japan) and this is the second point on which I differ from him. In my opinion Japanese birds—if Himalayan and Japanese are compared in a good series—are a much colder, more smoky grey in colour, with the upper parts more uniform and less heavily marked especially on the mantle and tertiaries. The lower tail-coverts are usually unbarred and the white patch on the outer tail feathers is usually further from the tip of the tail. There appears to be no existing name applicable to Himalayan birds and so I propose to call them

Caprimulgus indicus hazarae subsp. nov.

Type in the British Museum. ♂ 3 May 1871 Abbottabad, Hazara (A. O. Hume).

East and West Himalayan birds are identical.

There are three specimens from Hazara in the British Museum as well as specimens from the Simla and Mussoorie Hills so Stuart Baker is wrong in giving Kumaon as the western limit in the Himalayas. It is doubtless a slip that in *Nidification* (iii, 483-484) *indicus indicus* is given as breeding round Naini Tal, while *indicus jotaka* is said to breed in Kumaon.

There seems to be little doubt about the call of this species which is very noisy and a good idea of it will be obtained from the different versions that

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have been given. Butler (*S.F.*, iii) says it is 'loud and peculiar, resembling the words chuck chuck chur-r-r repeated several times continuously. James Davidson says that it is either 'tuk' 'tuk' constantly repeated or this with an occasional 'tukkoo' 'tukkoo' (*J.B.N.H.S.*, xii, 50). Whitehead considered it 'cuckoo' (the *u* pronounced like the *u* in luck) and said that it was used by both sexes (*J.B.N.H.S.*, xxi, 166). B. B. Osmaston goes into more detail:—'its call is of two kinds. Firstly a monosyllabic, chuck, chuck, chuck . . . repeated about half a dozen times at the rate of 5 'chucks' in 2 seconds. It has a second call, not so commonly heard, which is made up of dissyllables 'chucker-chucker-chucker'—repeated at the same rate as the first call (*J.B.N.H.S.*, xxvii, 949). With this description A. E. Jones concurs, adding that the males utter a soft not unmusical note 'you-you-you' while chasing another bird, probably the mate (*J.B.N.H.S.*, xxix, 286). Finally Mr. Salim Ali (*J.B.N.H.S.*, xxxvii, 138) says that 'the call is usually uttered from the branch of a tree on which the bird crouches lengthwise. The notes I have likened to water dripping on water (but much louder) at the rate of about 2 drips, a second, connected as it were by the echo of the dripping; *chuck-ko, chuck-ko, chuck-ko* and so on'. This recalls Legge's version of long ago *chump-pud, chump-pud*, repeated for several minutes.

Caprimulgus monticolus monticolus Franklin.

Caprimulgus monticolus Franklin, P.Z.S. 1830-31 (October 25, 1831), p. 116—Ganges between Calcutta and Benares and in the Vindhyian Hills between the latter place and Gurra Mandela on the Nerbudda.

Franklin's Nightjar was not observed by the Survey and there appear to be only three records of it in the Presidency. There is a male in the British Museum collected by Blanford fifty miles north of Ellore on 11 February 1871. Jerdon (*B. of I.*, i, 199) says that he obtained a specimen at Nellore. A female collected by Surgeon-General Fry in Travancore is in the British Museum. The status is of course unknown. So far as I can see there is only the one race of this Nightjar in India. Stuart Baker [*Bull. B.O.C.*, li, No. cccl (April 1931), p. 102] separated birds from Sikkim to Eastern Assam, Burma, etc. as *Caprimulgus monticolus burmanus* but he has presumably since given up this race as it does not appear in *Nidification*, vol. iii.

There need be no difficulty in identifying the call of this Nightjar which is very distinctive and once heard cannot be mistaken. Osmaston (*J.B.N.H.S.*, xxvii, 949) described it as a 'rather sharp penetrating note like "choo-ee" uttered on the wing'. I considered it 'like a loud grating chirp, which close at hand resolves itself almost exactly into the sound of a whiplash cutting through the air' (*J.B.N.H.S.*, xxviii, 284). Jones calls it 'a loud piercing "chweep" ' (*J.B.N.H.S.*, xxix, 286), and Waite repeats Mr. Osmaston's description (*J.B.N.H.S.*, xxxi, 821). Salim Ali (*J.B.N.H.S.*, xxxvii, 138) calls it a 'loud penetrating call of a single note "sweesh" '. It is uttered both from the ground and on the wing and sometimes from the top of a bush. In the pairing season it may be heard all night long, before dark and after dawn. When flushed during the day the bird gives a low chuckle.

In the interests of accuracy it may be as well to leave on record the fact that the specimen of *Caprimulgus mahrattensis* recorded from Gorakhpur (*J.B.N.H.S.*, xxii, 541) is really a juvenile of *Caprimulgus monticolus*. It is in my collection together with the rest of Mr. A. E. Osmaston's skins.

Caprimulgus asiaticus asiaticus Latham.

Caprimulgus asiaticus Latham, Index Ornith., vol. ii (1790), p. 588—India, Bombay.

Specimen collected:—876 ♂ 5-10-29 Seschachalam Hills 2,000 ft.

Measurements:—Bill 19 mm., wing in moult, tail 105 mm., tarsus 19 mm.

The above specimen provides the only reliable record of the Little Indian Nightjar on the eastern side of the Presidency. On the west there are more records. Betts tells us that in Coorg it is very common and that numbers may be seen sitting on the roads at night, their eyes showing up in the headlights of cars as ruby specks. As, however, he mentions no other species this record no doubt refers in part to other species as well.

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Fairbank obtained a single specimen, now in the British Museum on 5 June 1877 at the eastern base of the Palnis and remarks that it was the only Nightjar seen or heard in five weeks.

In the low country of Travancore it is very common according to Ferguson. Nothing has been recorded about the breeding season in the Presidency.

I have not been able to understand the division of this Nightjar into races satisfactorily. There are at any rate three colour phases, pale sandy, brown and grey and there appears to be some correlation of these phases with locality, the pale sandy birds coming from the North-West, the grey birds from the Deccan and the brown birds from other localities. The phases, however, so grade into each other and there seem to be so many exceptions to their connection with special localities that I hesitate to consider these colour phases as definitely subspecific.

Parrot, *Orn. Monatsb.*, 1907, p. 170, separated birds from Ceylon as *Caprimulgus asiaticus minor* on the ground of size. Ceylon birds are very small; wing in males 141.5-145 mm. whereas males from North-Western India measure 144-156 mm. There is complete intergradation between these two extremes though birds from Travancore and Mysore appear to be as small as those from Ceylon. Until I have seen more specimens, to determine these questions of colour and size, it seems more satisfactory to attribute all Indian birds to the typical race, accepting *minor* as the insular race.

The call of this species is well known and fully authenticated. It is often compared to the sound of a stone skidding quickly across ice. James Davidson (*J.B.N.H.S.*, xii, 50) syllabilises it as *tuk tuk tuk tookmaluk* but I think most people would prefer the rendering *chak chak chak char-r-r-r* (B. B. Osmaston, *J.B.N.H.S.*, xxvii, 949) or *tuk tuk tuk tukeroo* of the *Fauna*.

Lyncornis macrotis bourdilloni Hume.

Lyncornis bourdilloni Hume, Stray Feathers, vol. iii (1875), p. 302—Kalland Khauni, S. Travancore.

In Southern India the Great Eared Nightjar is entirely confined to Travancore and there is really very little on record about its actual distribution. The type was obtained on the 15th January at Kalland Khauni on the banks of the Peenaven-aur, about 15 miles north of Mynall at 600 ft., and Bourdillon then gave some note of its habits. His next communication on the subject in a letter to William Davison will be found in the *Ibis* for 1888, pp. 146-7 with reference to meeting it at Konegur. Ferguson's account appears to have been merely taken from Bourdillon and what little more we know about it is due to Stewart (apud Stuart Baker, *New Fauna*, iv, 375 and *Nidification*, iii, 490). It is there said to be confined to Central and South Travancore and to be moderately common from sea-level up to 2,000 ft.

The principal nesting months are February and March, but Stewart took eggs from the first week in January to the 1st of May.

In Tenasserim, William Davison found that this Nightjar spent the day in caves (*S.F.*, ix, 151), but this habit has not yet been noted in Travancore.

The 'wailing call' of the male as mentioned in the *New Fauna* is probably that described by Davison (*loc. cit.*)—'a full clear whistle which can be heard a very long distance off; it might be syllabilized two-wee-oo, each syllable lengthened out but specially so the middle one. Occasionally the first syllable is double and shortened too-too-wee-oo; this whistle the bird repeats at irregular intervals, one calling and another answering.'

The Indian forms are evidently subspecies of *Lyncornis macrotis* (Vigors) of the Philippines as pointed out by Hachisuka (*Birds of the Philippines*, Pt. III, p. 114).

Batrachostomus moniliger Blyth.

Batrachostomus moniliger Blyth, J.A.S.B., xviii (1849), p. 806—Ceylon.

The Ceylonese Frogmouth was not met by the Survey as it is confined to the South-Western Ghats and Ceylon. The distribution given in the *New Fauna* (iv, 382) and *Nidification* (iii, 494) is not extensive enough. This species is common in North Kanara (James Davidson, *J.B.N.H.S.*, xii, 50).

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In the Presidency it was seen in Coorg by Jerdon (*J.A.S.B.*, xiv, 209) who also tells us (*B. of I.*, i, 189) that Capt. Roberts of the 36th N. I. obtained it on the Peria Pass leading from Malabar into the Wynaad.

In Travancore according to Bourdillon (*S.F.*, iv, 376) it is not uncommon about 2,000-3,000 ft. elevation in the hills. Stewart (apud *Nidification*, iii, 494) says that it is most common at about 2,000 ft., occurring also up to 4,000 ft. and nearly down to the level of the plains. The normal breeding season is according to him from January to April, but odd eggs were taken from June to September.

The call does not yet seem to be properly identified. James Davidson (*loc. cit.*) attributed 'a wailing cry' to it. Bourdillon on the other hand (*S.F.*, iv, 376) considered it had a 'loud chuckling cry, with somewhat the tone of a Goatsucker and not unlike the laugh of some Kingfishers, a difficult cry to describe'. Legge agrees with this description as representing a call which he also attributed to this species. In the *New Fauna* the ordinary call is said to be a soft *kooroo-kooroo* repeated several times.

I have at present no reason to separate Indian and Ceylonese birds as the plumage is variable and I have only seen a poor series. The whole group appears to be in need of revision as regards the specific and subspecific arrangement of the various recognised forms.

(*To be continued*).

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THE PAPAW TREE.

BY

J. F. CAIUS, S.J., F.L.S.

The CARICACEAE, natives of tropical America and Africa, are a small family of plants, including 4 genera and 45 species.

The family has been named after one of its genera, the genus CARICA. This generic name is derived from the Greek word *Karikos* which means *of* or *from Caria*, a province of Asia Minor, erroneously supposed at one time to have been the habitat of the papayads. The genus Carica numbers 30 species, inhabiting warm America.

The papayads are small trees, generally without branches. They have large palmately-lobed leaves, and on being wounded in certain parts they exude an acrid milky juice. Their flowers are borne in racemes proceeding from the bases of the leaf-stalks, the male and female flowers being usually on different trees. The male flowers have a funnel-shaped corolla, into the throat of which the ten stamens are inserted in two rows of five, one above the other; and the female flowers have a corolla of five distinct petals. The fruit is fleshy, and does not split open when ripe.

The most remarkable species is the PAPAW TREE, known to botanists as: *Carica Papaya*, Linn. Sp. Pl. 1036; *C. hermaphrodita*, Blanco, Fl. Filip., ed. i, 205; *Papaya Carica*, Gaertn. Fruct. ii, t. 122; *P. communis*, Noronha, in Verh. Batav. gen. v (1790), ed. i, Art. iv, 23; *P. cucumerina*, Noronha, loc. cit.; *P. sativa*, Tuss. Fl. Antill., iii, 45; *P. vulgaris*, DC. Poir. Encycl., v, 3.

OCCURRENCE.

Carica Papaya Linn. is considered a native of the West Indies, the shores of the Gulf of Mexico, and perhaps of Brazil. Its specific name 'papaya' is evidently American, whether derived from the Carib 'ababai' or not. The tree has now become acclimated in the hot regions of three continents; and the zone of most abundant growth seems to lie on either side of the Equator where the mean annual temperature is 77°F., provided soil and rainfall are favourable. It is grown by cultivation north and south of that zone. It is to be found throughout India, from Delhi to Ceylon; but it cannot be cultivated on the hills, except in the south where it is productive up to 4,000 ft.

It is quite common for numerous papaw plants to spring up from seeds scattered by birds over a portion of land which, according to tropical custom, has been cleared by burning away the trees and undergrowth. There are, however, no forests of papaws because the plants need sun and room. They are seldom seen among dense growths, nor do they propagate in clusters.

The papaw seems to be at its best in the rich humus of a hillside, and rarely takes to a swampy or sandy soil. It grows at the edge of the sea with the waves washing its roots; it prospers on

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the high mountain plateaus of all the windward and leeward islands; it flourishes—but does not attain to any great height—on the bare coral rocks of Yucatan; it thrives in the sandy soil of Venezuelan ravines, where rain averages one metre per annum and the climate is very equable; it grows prolifically without much cultivation or care in Peruvian valleys; it shoots up to a height of over one hundred feet in the trans-Andean regions; it appears spontaneously in waste places on the islands of Guam, where it receives but scant attention from the natives. However, those places seem best suited to the papaw where it does not rain but always pours, where daily rains abound throughout the year—pouring, soaking rains with a fierce bright sun shining all through the downpour.

Characteristics.

Papaw trees present a striking appearance with their straight slim shiny trunks, and their bright green umbrella tops; but whether they are a thing of beauty is a matter of personal taste. 'This well known tree', says Woodrow, 'has been subjected to ill-merited abuse, described as ugly and everything that is disagreeable, yet it may be questioned if there is a more handsome or generally useful tree in Indian gardens.'

The Papaw tree suggests a palm in its habit of growth. It has a single, supple, slim, straight stem, terminating in a crown of large leaves, and branching only when its growth is interfered with. Cultivated plants attain a height of from 10 to 30 ft.; wild varieties push up to 60 or even to 100 ft. Near the base of mature trees the diameter ranges from 6 in. to 1 ft., the stem tapering gradually to about 4 or 5 in. at the summit. In a young plant the stem consists of a cellular pith filled with water; in a matured tree that portion of the trunk immediately under the bark is fibrous for a few inches, followed by a soft inner layer one inch or more thick terminating in the central portion which is hollow. At intervals through the hollow centre are to be seen membranous tissues dividing the cavity into sections, and in the rainy season, for a considerable height up the trunk, this central cavity is filled with water. The wood is soft, white and spongy; it cuts easier than a potato, so that the trunk can be chopped through by a single stroke of a cutlass; it is full of water, decays rapidly, and does not serve any useful purpose. The trunk is covered with a grey (green at the top) smooth, tough bark laid on in folds, which at intervals form ridges.

A large turnip-shaped tap root reaches deep down into the earth to seek nourishment and to give stability to the tree. This root is similar in structure to the trunk, except for a white bark, and possesses an odour of cabbage and a peculiar taste suggesting radishes.

The leaf-stalks diverge almost horizontally from the trunk; they are large and hollow, cylindrical toward the leaf and flattened at the point where they join with the stem. The leaves are frequently as much as two feet in diameter, deeply cut into broad lobes terminating in sharp points and having their margins irregularly waved or gashed; they are dark green on the upper and

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light green on the under side; they are shortlived and, as the tree shoots upwards, they drop off, leaving scarry marks on the bark of the tree trunk.

Pitcher formation was observed by Miss Mozelle Isaacs in the leaves of trees growing in the grounds of the Dadar Parsi Colony and of St. Xavier's College, both in Bombay. Pitchers may be best described as modified leaves; and as they only show during the monsoon, it has been surmised that they are due to the vigorous growth of plant life during that period and to the lack of the necessary space for them to develop into ordinary leaves. For in the process of pitcher formation, always found in female plants which usually have larger leaves than the male plants, new veins find themselves impeded from developing normally in the plane of the old leaf as all the available space is already occupied by many strong veins issuing from the same point; these new veins are consequently pushed upwards, and they develop into stalked simple leaves with a basal pocket.

Circumstances of climate, soil and cultivation may, however, so modify the characteristic features of the plant that discrepant descriptions and statements are on record. Among the notable varieties are the green and the violet papaw. This latter variety, which exhibits a purple stem and purple leaf-stalks, has had considerable attention paid to it and is more highly esteemed for cultivation. While young the trees are kept in the shade and pruned to prevent their growing tall; portions of the flowers are picked off to favour fruiting; and the smaller fruits are removed when green, so that the remainder may grow larger and stronger—indeed a fruit weighing 20 pounds is no rarity. The violet papaw is such a pliant plant that horticulturists boast of having produced a dwarf variety. But the green papaw is less adaptable; though it grows to a greater height, its fruit is smaller and possesses a less pleasant flavour.

The male tree produces long hanging clusters of narrow trumpet-shaped flowers having 10 anthers inserted on the throat of the corolla. The female tree bears single flowers with a white, yellow, or purple corolla of 5 sessile petals, and one pistil bearing a 5-rayed stigma. The female flowers grow in considerable numbers at the apex of the stem, which pushes rapidly upwards and puts out new leaf-stalks. Occasionally, bisexual flowers are produced by either male or female trees.

There is no definite flowering season, and the tree bears fruit all the year round. The fruit develops so rapidly that buds of flowers and ripe fruits are often found on a tree at the same time.

The fruit grows from the axils of the lower leaves, the normal fruit from the female flowers being sessile while that from the hermaphrodite flowers is borne on long pedicels. It varies considerably in form as well as in size, resembling an orange, or a gourd, or a cocoa pod, or a musk melon, or even a water melon. It is of a green or purplish colour turning yellow when ripe:

'The slim papaya ripens its yellow fruit for thee'—(Bryant).

Its skin is smooth and thin. The flesh of the green fruit is white, tough and watery; but as the fruit ripens its flesh becomes

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juicy and assumes a pinkish or orange hue, or turns to musk-melon yellow. The fruit has a central cavity which contains the seeds arranged in five lines along the whole length of it, and attached to, and held together by, a delicate membrane which constitutes the inner skin of the fruit. The fruit does not last long after ripeness sets in.

Miss Mozelle Isaacs has noted the presence of large white parenchymatous masses in the fruit of the papaw tree. She has also recorded the occasional appearance of long leafy structures: 'in some cases the funiculus is elongated, the integuments of the ovule absorbed in the elongation of the stalk, and the cotyledons and plumule of the seedling inside exposed giving the appearance of vivipary inside the fruit.'

Different names are sometimes employed to distinguish various forms of the fruit, as 'Ceylon', 'Madagascar', 'West Indies', etc.; these names are, however, misleading, for nowhere in the Eastern Tropics is the tree indigenous, and everywhere, as already stated, there occurs a good deal of variety as regards size and shape.

The seeds are of the size of small peas; about 230 when fresh go to an ounce, or 500 when partly dried. When fresh, they are dark brown changing to black on drying. Before desiccation their outer membranous coating is transparent and slimy; the inner coating is hard, horny and wrinkled; and between the two coatings there is a mucilaginous substance containing myrosin. The inner shell contains the leaf-like cotyledons, veined at the base with an albuminous homotropal embryo with a roundish radicle easily distinguished when slightly magnified. The seeds when dried resemble pepper-corns; they are aromatic, pungent, piquant—but not so sharp as mustard—and their taste slightly suggests water cress.

All the parts of the plant abound in milky juice or latex, which is found most abundantly just under the skin of the fruit before ripening.

Hermaphroditism.

It is a common belief in the Gold Coast Colony that a male papaw can be made to bear fruits. This is done sometimes by cutting off the top of the male tree, which is then believed to produce fruit-bearing stalks. Another method is to make one or two holes right through the stem below the flowers, a stone or piece of wood being occasionally inserted to keep the hole open.

As a matter of fact the papaw plant is extremely variable in regard to its sexual characteristics. There are two extreme types —one strictly dioecious, the other monoecious—and many intermediate forms. In the strictly dioecious type, the fruit-bearing plant has pistillate flowers only, while the male plant produces almost exclusively staminate flowers in bunches towards the end of long peduncles: each flower has a rudimentary ovary and a style without stigma, being thus incapable of bearing fruit.

It sometimes happens that male trees produce hermaphrodite and pistillate flowers abruptly and unexpectedly. This monoecious type of plant bears fruit in every case; but the trees look from a distance as if they were female plants of the dioecious type. They generally produce two kinds of flowers, the one staminate and the

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other perfect. The perfect flower is quite different in shape from the pistillate flower of the dioecious type. Its ovary is much more elongated, being almost cylindrical. The stamens are usually placed on the inner walls of the petals midway down, with the anthers surrounding the lobes of the stigma. The fruit of this type differs from that of the dioecious type in the same way as the ovary, and is often called a 'long papaw'.

Another monoecious form is the plant in the process of changing its sex. It is not at all uncommon for a male plant, after producing staminate flowers for some time, to bear hermaphrodite flowers which in their turn are succeeded by pistillate fruit-bearing flowers. Miss Mozelle Isaacs has, moreover, witnessed the process of change exhibited by a female plant at Santa Cruz, near Bombay. She observed a fruit-bearing tree growing near a drain, changing its sex subsequently on the closing of the drain: the flowers became gradually smaller, lost their ovary, and began to appear in bunches on longer and longer branched inflorescences instead of singly in the axils of the leaves.

It has been repeatedly stated that the removal of the terminal bud causes male papaws to change their sex, and that trees treated at definitely recurring periods are the ones that exhibit this phenomenon. It is suggested that the plant has definite short cycles of growth and that it may be necessary to remove the top at some definite phase of this cycle in order to foster the development of fertile flowers.

To test the correctness of this statement L. B. Kulkarni selected a dozen male plants in the Ganeshkind Botanical Gardens, near Poona, and 'had their growing tips nipped off at the time of flowering. In a fortnight, there appeared a cluster of flowers round the cut portion; on examination eleven trees showed all male flowers, and one plant was found to have produced one hermaphrodite flower among clusters of male flowers. The male flowers on all plants were normal. The one hermaphrodite flower that was produced had five stamens attached to the base of the petals and placed round the syncarpous ovary. The fruit formed was a little oblong. This fruit dropped before ripening. The rest of the trees continued to produce male flowers on long peduncles as usual. The only effect of the pruning of the top was that the trees produced three or four branches.'

This finding supported that of the Hawaii Agricultural Experiment Station: 'It has been reported that staminate trees have been caused to produce pistillate flowers and fruit by beheading them. None of these means have proved to be successful from a practical standpoint.' It may, therefore, safely be concluded that the change of sex displayed by the male papaw does not appear to be in any way connected with the removal or retention of the terminal bud.

It would be puerile to attempt to describe all the intermediate forms which have been observed, for their name is legion and the difference among them is often trivial. However, mention ought to be made of two forms which, strangely enough, have been reported from such widely separated places as Ganeshkind and Hawaii. In the words of L. B. Kulkarni: '(*a*) One plant

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produced four types of flowers, namely: (1) staminate flowers, (2) and (3) two forms of perfect flowers, and (4) one form of pistillate flowers. The staminate flowers were exactly like those of the second or monoecious type above described. Of the two perfect flowers, one form corresponded precisely with that of the monoecious type, while the other had an ovary in shape like that of the pistillate flowers of the dioecious type. There were usually ten stamens attached to the base of the petals round the ovary in the first form—and only five stamens similarly attached in the second form. The pistillate flowers were exactly like those of the dioecious type.' '(*b*) Two plants bore only staminate flowers, but these flowers were carried close to the stem in the axil of the leaf. This is peculiar, as the trees usually producing staminate flowers have their flowers on long peduncles.'

There is, nevertheless, no doubt that the wild papaw in its natural habitat is unisexual. Sex perversion is one of the effects of migration and cultivation.

Cultivation.

Rusby has stated that this tree 'can be propagated and grown with great readiness, that its vitality is so great that it is with difficulty destroyed until its natural course has been run.' On the other hand six years' observation has convinced Kilmer that the papaw is exceedingly difficult of cultivation, and that the cultivated trees are most easily destroyed by adverse conditions.

The wild plants do not seem to be attacked by disease except after injury, but the cultivated plants are very susceptible to every sort of malady. Insects attack the tender leaves of the young plants and they wither. Fungi and bacteria find in the papaw suitable conditions for growing and multiplying, and they do grow and multiply at the expense of their host's vitality. After fruiting, and especially if the fruits are bled, the tree will suffer from general debility and become the prey of every adverse circumstance. And the trouble, whatever its nature, may be said always to arise from the inherent weakness of the cultivated plant in its altered environment.

It is, nevertheless, reported that in Ceylon, in Brazil, in Algeria and in the islands of La Reunion and the West Indies, successful and extensive cultivations have been carried out.

It is mentioned in the *Hawaii Agricultural Experiment Station Report* for 1911 that 'there is no means available for the propagation of the papaya by asexual parts, as cuttings, buds, scions, etc., hence seed varieties must be established by methods probably similar to those used in breeding varieties of vegetables and flowers which are not propagated by budding and grafting.' But Burns wrote in 1918: 'This excellent fruit is easily grown. It is propagated by seeds, but may also be propagated by cuttings.' And propagation by grafting has been tried with some success at Lucknow, at Ganeshkind, and also in the United States of America.

Propagation by cuttings or by grafting may perhaps not have yielded results which would commend it to the cultivator as a means to increase his harvest. Nevertheless this propagation is

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not without its experimental value; for, if persistently carried on, it may contribute towards the solution of a problem which has hitherto baffled scientists and cultivators alike. One never knows what a seedling is going to develop into, and the question of the inheritance of characters in the papaw is one which needs answering very badly; for there happen to be such differences between papaw and papaw that no two trees resemble each other—which is a source of constant anxiety to the cultivator as will be presently shown.

To begin with, the seeds vary considerably in number: in some fruits there are five; in others, over five hundred. But this does not mean five or five hundred potential trees. Thus, for example, when in the West Indies a native wishes to grow a single tree he buries two or three such fruits in the ground; for he knows by experience that at most two or three plants will result. Nothing could show more clearly that very few seeds are fertile, so that a discriminate selection becomes imperative. Experiments were, accordingly, carried out and it was found that seeds taken from the central portion of the largest and finest fruits were the most likely to be fertile. Seeds selected with extreme care from strong and healthy trees, the fruit of which would weigh fifteen pounds, were then sown: only a portion of the plants took after the parent stock, the other portion reverted to the wild prototype and yielded fruits the size of a hen's egg. In another series of plantings conducted with thorough preparation of the ground and selection of seeds, together with care for the young plants, only a small proportion came to maturity, and of these only a few bore fruit: none of the plants or their fruits was as large as those of the parent stock.

But still more perplexing are the vagaries of sex relation, which make the proper adjustment of the sexes difficult and exasperating. It is generally agreed that for fertilization one male to ten female plants is the proper ratio; but Kilmer speaks of numerous instances where acres of land were planted with thousands of papaw plants in which the males were in the majority of over fifteen to one. And as it is not until the flowers appear that the two kinds of tree, male and female, are distinguishable, one can imagine the cultivator's dismay when he finds at the end of all his toil and waiting—which may be as much as twenty months—that he has a plantation of unprofitable male plants.

It is best to sow the seeds in well-drained porous soil covering them about half an inch deep. In from two to six weeks the seedlings appear, germination being hastened by heat. In about a month after germination the seedlings are large enough to be transplanted to pots in which they remain for another month before being placed in the orchard where holes four feet deep and four feet wide were dug previously. The distances between trees should be about ten feet in each direction. Seeds may also be sown at stake, allowing five or six to each hole, leaving afterwards one good seedling to each hole.

The papaw tree likes deep humous or loamy soil, and flat or gently sloping well-manured land. The following fertilizer has been

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successfully tried at the Hawaii Experimental Station on young plants: superphosphate, 800; sulphate of potash, 315; nitrate of soda, 250; sulphate of ammonia, 190; and black sand (volcanic ash), 445 parts. This has been applied at the rate of one pound per tree at planting time. In the Bombay Presidency, house, farm, or stable refuse, twenty cartloads per acre, has been used with success. It has also been found that two ploughings and two harrowings just before sowing the seed improve the growth.

Once established, the plant is capable of enduring a wide range of moisture variations in the soil, but it is very sensitive to water-logging. Until the blossoming stage is reached the two kinds of tree are indistinguishable, and hence twice the desired number of seedlings must be planted, and all the males, except four per acre, cut out when they are recognisable. In some localities the plant begins to grow fruit in seven months; in others, eighteen to twenty months from the seed. The fruiting is abundant and continuous. In the course of one season a wild tree has been known to yield from two to three hundred fruits varying in size from a golf ball to a cricket ball. The cultivated plants may be made to yield from twelve to sixty fruits, weighing from five to twenty pounds each.

The fruits of the papaw are borne round the stem in such a way that they interfere seriously with one another's growth. It is, therefore, advantageous to remove a certain number of them to allow the rest to develop better. The difficulty is to hit on exactly the right amount of thinning to get the greatest weight compatible with the greatest number of fruits. This can only be obtained by practice and in the meantime it is advisable to remove only such fruits as are obviously going to be badly squeezed.

It is also a good thing to cut off the top of the young tree, thus forcing it to branch. Each branch bears fruits, and the bearing capacity of the tree is multiplied. It has also been observed that the branched plants were less frequently damaged by winds, and that the fruit was easy to watch and to harvest. The system of branching is very beneficial in places where the nights are cold, since the plant is protected from frost, and the fruit is produced near the ground.

The fruits on the tree must be protected from the direct rays of the sun or they scorch and split. The dead leaves of the tree should be removed as they dry up. The fruit is to be cut from the tree when full sized, but green, and is laid on soft straw to ripen. The even ripening of the papaw is a matter of considerable practical difficulty.

As a rule the tree is played out after five years' continuous cropping. Kilmer reports that a rare specimen was observed which was eighteen years old, and was bearing one to two fruits each year.

Domestic Uses.

In Africa, America, and the West Indies the bark of the stem is used in the manufacture of ropes.

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The hollow leaf-stalks are often used as trumpets by the natives of Guam, some of whom excel in sounding military bugle calls upon them.

The property of the papaw to render meat tender is commonly made use of by cooks, who wrap the leaves round fresh meat, or place a piece of the green fruit in the water in which the meat is being boiled, or drop a little of the fresh juice in the vessel in which the meat is being cooked. In its tropical home the papaw is put into the pot with meat, and enters into cereals, soups, stews and other dishes. Most of the half-breeds in South America and the adjacent islands are particularly given to meat diet; many of them eat it raw, sometimes in a state of partial decay; and here the papaw is brought into use, being eaten with the flesh or rubbed over it before it is eaten.

In the Gold Coast Colony the leaves are added to the water when washing clothes to remove stains. In the Philippine Islands water in which the leaves have been boiled is used to wash off blood stains. In the West Indies the green leaves or slices of the green fruit are rubbed over soiled and spotted clothes, and its power of dissolving stains has earned for the papaw the name of 'melon bleach'. Elsewhere water in which a portion of the fruit has been steeped is used in washing dyed (especially black) clothes without in any way discolouring them.

Again, women in Brazil and the West Indies use the juice of the unripe fruit as a cosmetic; they apply it for freckles and for making the skin smooth and delicate. Says Kilmer: 'The strange and beautiful races of the Antilles astonish the eyes of the traveller who sees them for the first time. It has been said that they have taken their black, brown, olive and yellow skin tints from the satiny and bright-hued rinds of the fruit which surround them. If they are to be believed, the mystery of their clear, clean complexions, and exquisite pulp-like flesh arises from the use of the papaw fruit as a cosmetic. A slice of the ripe fruit is rubbed over the skin and is said to dissolve spare flesh and remove every blemish. It is a toilet requisite in use by the young and the old, producing according to the words of a French writer "the most beautiful specimens of the human race".'

When the natives of New Caledonia run short of tobacco they smoke the leaf of the papaw as a substitute. Writing from Nukahiva in 1879, M. Jouan, *capitaine de vaisseau*, tells of the trouble he experienced to keep donkeys away from his papaw trees, such was the attraction of the leaves for those animals! On the other hand, the French sailor says that the smell of the seeds was too much for the cats which turned up their noses and beat a hasty retreat.

That asses, however, are not the only members of the equine family that have a craving for the papaw, was observed by a most reliable witness, Brother Joseph Pascual, now residing in St. Xavier's College, Bombay, and from 1922 to 1923 in charge of Gayaba, a plantation situated ten miles from Madang in pre-war German New Guinea. According to the witness, Mauritz, a small long-tailed chestnut horse, imported into New Guinea from one

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of the neighbouring islands, was always inclined to leave the beaten track and to make a bee line for the nearest papaw tree—papaws grow wild in those parts—and Mauritz's rider could neither doze nor daydream, else he would be brought back to the stern reality under a papaw tree with Mauritz greedily devouring the leaves. But it was not only the leaves that Mauritz ate; he also sampled the fruits which he took whole—skin, flesh and seeds. And if the fruit happened to be somewhat over-ripe it was a sight to see Mauritz gobbling up the dainty with his heart in his mouth, and with the golden coloured juice and squash dripping from the corners of his lower lip.

It would also seem that in South America the younger generation makes use of the seeds to indulge their sporting propensities. As the seeds are encased in a slimy coating advantage is taken of this by playful youngsters who spread them out on a board, and by this means form a 'slide', the counterpart of the frozen gutter so agreeable to northern urchins!

In Upper Tongking, among the Tho and Man hill tribes, the fruits are fed to pigs. Throughout the West Indian islands the fruits and the leaves are fed to old hogs or poultry in the belief that their flesh will without fail become tender.

Food.

The papaw is not everywhere held in like esteem. The natives of Guam and the Marquesas do not seem to set any store by it, they only eat it when there happens to be a scarcity of other kinds of fruit. This is all the more strange because the inhabitants of the Loyalty Islands and of the other coral islands in the Pacific relish the papaw as a welcome addition to their otherwise scanty fare.

Elsewhere the papaw is considered a wholesome and nutritious food, and consumed in large quantities at all stages of its development. In every West Indian and South American village one will find a place where the native products are bought and sold, and where the wayfarer is sure to come upon an abundant supply of papaws.

As an article of food the papaw is prepared in a score of ways and made into a variety of edible dishes and delicacies.

The green fruit is cooked in curries, and is made into plain and spiced pickles which are highly esteemed. It is also boiled or stewed, and served as a vegetable. In this form it makes a splendid addition to poultry mash; and, if mixed with lime juice and sugar, is an excellent substitute for apple sauce. Europeans in Indo-China prepare it as they would salsify or artichoke.

In Malaya the green fruit, peeled, boiled, cut into small pieces, and dressed with oil, vinegar, salt and pepper is served as a vegetable. It is said to be very palatable and very similar to squash in taste.

The half-ripe fruit lightly fried in butter is a good addition to meat *à la jardinière*, and also a good ingredient in chicken or lobster salad.

The following is a useful recipe for the preparation of papaw

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jam: 'Choose fruit three-quarters ripe; remove all skin and seeds, chop up the fruit into small pieces; weigh; add equal weight of sugar, also some green ginger (cut into small pieces), 2 oz. of the latter being sufficient for 6 lb. of fruit; cover up the fruit and sugar, and let the latter dissolve during the night; boil up the next morning until done.'

When not quite ripe the fruit makes a good salad if cut into slices, dressed with oil, vinegar, salt and pepper, and prepared one hour before it is served. In combination with lettuce and sliced cucumber, papaws make a wholesome and nourishing salad.

The fruit, just before ripening, is peeled and sliced, macerated in cold water, with frequent changes of water for some hours; the macerated fruit is then dropped into boiling water, boiled sharply, and served as a vegetable.

The ripe fruit is generally esteemed as a table fruit, and is then eaten uncooked. It has been described as sweet, refreshing, and agreeable; but, every one will admit that it may be sickly, sweet, and insipid. The sweetness of its resinous, pulpy juice often clings to the tongue and remains prevalent for hours. In fact the stranger has first to develop a taste before he can enjoy the flavour of the fruit, and acquire a liking for it. Some people prefer to eat the papaw with salt, with salt and pepper, with a little sugar, with fresh lemon or lime juice, with sherry and cream.

In the Gold Coast Colony the ripe fruit is sometimes cooked together with corn and palm oil. In the West Indies and South America it is combined with some acid fruit and made into tarts; and at the sugar houses slices of the papaw are often seen seething in hot syrup, and pies, shortcakes, sherbets, and pickles from the fruit are greatly relished.

Excellent preserves are made of the ripe fruit, which, for this purpose, is boiled down in sugar and candied. In Indo-China the preserves are flavoured with kirsh or marasquino.

The ripe papaw is also made into jam, marmalade, jelly; it is candied, iced, crystallized and made to rival the best products of the confectioner's shop. 'Le fruit du papayer se transforme, par la confiserie, en un fruit confit d'un goût très fin et délicat rappelant celui du marron glacé associé à celui de la noisette.'

The seeds are eaten as a delicacy. They have an agreeable taste somewhat like water cress; and a piquancy suggestive of mustard. Macerated in vinegar they are served as a condiment. The natives of the tropics quite often chew them to quench their thirst.

In Malaya the small fragrant flowers of the male plant are used in the manufacture of a syrup.

Finally, when a tree has become unproductive and is cut down, the soft, pithy heart is carefully removed and grated and served in just about the same manner as a cocoanut.

Popular Beliefs.

The papaw is credited to be possessed of latent and strange powers, some of them so strange that they are here set down under the heading of popular beliefs.

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In Barbados the flesh of animals is reported to be hung in the papaw tree overnight in order to soften it. The same idea prevails all over India and this practice is no doubt resorted to by domestic servants and meat and fowl are often hung in the branches of a papaw tree to make them soft and tender.

The statement has likewise passed current that the emanations from the papaw tree will dissolve and digest albumin. Another statement has it that if male animals browse under the papaw tree, they thereby become emasculated.

In Africa the odour emitted by the flowers is believed to be a cause of disease.

A popular belief prevails amongst all classes of women in Southern and Western India that if a pregnant woman partake of even a moderate quantity of the fruit or of the seed, abortion will be the probable result.

In Tongking people suffering from fever are told not to eat of the papaw fruit.

In Kelantan the milky juice of the unripe fruit, mixed with the juice of the immature capsules of the horse-radish tree and the white of a lizard's egg, is used as a poison; when taken internally this is said to be followed by great abdominal pain and the presence of blood in the urine.

The papaw has been alluded to as the mustard tree of the Scriptures.

Medicinal Uses.

A plant so universally distributed and possessed of such varied properties, naturally occupies an important place in native materia medica. Though of relatively recent introduction into India it is, nevertheless, a part of the armamentarium of Ayurveda and Yunani practitioners alike. Medicinal properties are ascribed to practically every part of the tree: the root, the leaf, the seed, the fruit, and the milky juice.

To begin with the root, it is said to be a generative tonic. In Cambodia it is considered diuretic, and it is given internally to arrest the flow of blood in abnormal uterine haemorrhage. In French Guinea it is credited with anthelmintic properties, and as a vermifuge a preparation is recommended consisting of leaves and twigs of purslane 2.8 gram, fresh papaw root 0.75 gram, water 48 oz., the whole boiled down to 32 oz. In the Gold Coast Colony it is said to cure yaws and also piles: the root is ground up and mixed with salt forming a paste which is then treated with water, and the resulting solution is used as an enema; this is supposed to cause abortion in pregnant women, and its use is probably restricted to educated native women of social standing. In Mauritius the dry root has been used successfully in the treatment of kidney trouble.

As regards the leaves, they are used as a worm remedy in French Guinea. A decoction is given as a purgative to horses, and has been recommended for the treatment of bots; but Steyn in South Africa has experimentally disproved its efficacy for this purpose. In the Gold Coast Colony the dry leaves are steeped in

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water and the yellowish-red liquor is drunk to cure stomach trouble. In the Philippine Islands a decoction of the leaves is applied as a lotion to wounds and atonic ulcers, or the boiled leaves are crushed and made into a poultice. In the Santal Parganas of India the leaves are reputed to promote the secretion of milk: they should be gently bruised and heated in a pan and applied warm to the breast. In Western India the leaves are used externally for nervous pains; the leaf may be either dipped in hot water or warmed over a fire and applied to the painful part. In Southern India the bruised leaves applied as a poultice are said to have an excellent influence in reducing elephantoid growth. They are also used to extract guinea-worms: an ounce of the leaf is rubbed with sixty grains of opium and sixty grains of common salt, and the paste applied to the affected part—'of course the worm has to be wound out in the usual manner,' but it always comes out more quickly and easily when treated in this way'.

To come to the seeds, wherever the papaw tree is found growing its seeds are used as anthelmintic and emmenagogue. In India their juice is made into pessaries to procure abortion. The juice, or a paste obtained by grinding the seeds with glycerin, is used as a cure for ringworm and psoriasis. Mixed with honey the seeds are given to expel roundworms; they are also said to be useful in dyspepsia and in enlargement of liver and spleen. In Cambodia they are prescribed in bites and stings of poisonous insects. In Central and South America they are given as a thirst quencher, and they form a component part of a drink used in fever; they are also used as a carminative.

Furthermore, the ripe fruit is alterative. It acts as a mild laxative and, if regularly eaten every morning, corrects the habitual constipation so common in India. It also acts as a mild cholagogue; hence its use for piles, and for enlarged liver and spleen; to reduce an enlarged spleen the fruit is preferably taken dry and salted. In some parts of India the ripe fruit is said to be useful in chronic diarrhoea, and in some of the Malay islands it is given in dysentery. Syrups, wines, elixirs made from ripe fruit are said to be expectorant, sedative and tonic. The green fruit is a mild laxative and diuretic; when made into a curry it is eaten by women to excite secretion of milk; it possesses ecbolic properties and is often resorted to by natives to induce criminal abortion. The mature green fruit, sliced, dried and powdered, is given in doses of from 5 to 20 grains for dyspepsia. In the Philippine Islands, more especially in the province of Bulakan and in Pampanga, a decoction of the green fruit is a popular remedy for indigestion. In the West Indies a slice of the green papaw is rubbed over the pimples which accompany the first stages of the yaws, to abort them; and it is claimed that the ulcers which follow the pimples may also be cleaned in a similar manner. In one instance apparent clinical benefit from eating the fruit was claimed by a diabetic patient; but Bischoff, Long and Sahyum failed to discover any hypoglycaemic action when feeding the fruit to rabbits.

Finally the milky juice or latex has among others a well known medicinal property, for the discovery of which the world is in

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the first instance indebted to an old negro woman. Cossigny relates that on her master's farm this woman was entrusted with the humble task of feeding the pigs. Now it happened that she was suffering from worms and had tried many a remedy, but thus far without any success. In course of time she noticed that whenever she fed her charges with slices of green papaw, the animals passed worms. Putting two and two together she started eating sliced green papaw and was relieved of her trouble. On hearing of this unexpected cure the men of science attributed it to the milky juice or latex contained in the green papaw; and a series of experiments afterwards proved that their surmise was correct.

The milky juice of the unripe fruit has ever since been considered anthelmintic and used as such, especially against roundworms. The following mode of administration is still adopted in Mauritius: 'Take of the fresh papaw milk and honey, of each a tablespoonful; mix thoroughly; gradually add three or four tablespoonfuls of boiling water, and when sufficiently cool take the whole at a draught, following its administration two hours subsequently by a dose of castor oil to which a portion of lime-juice or vinegar may be added. This may be repeated two days successively, if required. The above is a dose for an adult, half the quantity may be given to children between seven and ten years of age, and a third, or a teaspoonful, to children under three years. If it cause griping, as it occasionally does, enemas containing sugar have been found effectual in relieving it.' In Brazil the juice is given in very small doses to avoid intestinal inflammation.

The medicinal uses of the latex are not however limited to the removal of worms. The author of the *Makhzhan* mentions it as a remedy for haemoptysis, bleeding piles, and ulcers of the urinary passage; it is also useful in dyspepsia; rubbing the milk in, two or three times, cures ringworm or psoriasis causing a copious exudation attended with itching. The juice is often used externally to prevent suppuration. Kilmer writes: 'A malady which the natives call the "cocoa bag" is a troublesome tropical disease, reputed to be hereditary and contagious; at all events it seems to lurk in the blood of persons of otherwise apparently good health and habits. Suddenly the victim becomes a mass of offensive sores, debilitated, etc. The native doctors add the papaw fruit to the diet drinks used in this disease, and succeed in moderating its violence at least. To the sores a paste made with the papaw milk as one of the constituents is also applied.' Again: 'I witnessed a most striking cleansing of a black foot in which the chiga had bored and laid its eggs, producing a mass of foulness beyond description. Here a paste of the papaw milk was pushed into the seething mass and kept for forty-eight hours. It was then flushed, curetted, and antiseptics were applied. A clean wound which readily healed resulted.' The juice will remove pimples and thickened skin as in eczema and corns. It has been used successfully for stomach trouble; it is a reliable stomachic, and is slightly laxative; but it should not be given to pregnant women, as it is emmenagogue. It is applied locally to the *os uteri* to procure abortion. It is also said to be a certain remedy in cases of scorpion

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sting, a statement which has been experimentally disproved by Caius and Mhaskar. The milk has been employed in splenic and hepatic enlargements with good results; a teaspoonful with an equal quantity of sugar divided into three doses was administered daily.

The latex is slightly caustic and irritating to the skin, so much so that the collectors get blistered fingers. It has great digesting properties; if dropped on raw meat it dissolves it in a few minutes, and it is, no doubt, to this property that it owes its reputation as a digestive. It has long been used for whooping-cough in Honolulu. It has also been given with good results in diphtheria. A solution of 10 to 30 drops, applied as a paint, rapidly dissolved the false membrane. A number of cases in a hospital for children were cured by this treatment.

The milky juice is extracted by making shallow incisions with a bone or ivory knife, or a wooden splinter, in the rind of the mature but unripe fruit; the juice rapidly exudes from the cuts and is collected in a cup held beneath, then spread on glass to dry in the sun or, if the weather be wet, over a stove or in a hot-air chamber. Drying should be effected without delay but should not be too rapid, a temperature of about 100°F. being the best. The process should be completed in about 24 hours. When the material is crisp-dry, it is reduced to a fine powder, or made into a granular form, and marketed as 'papain'. About 5 to 8 oz. dried papain may be obtained per tree in a year, or an average of about 150 lbs. per acre. The fruits may be tapped at intervals of two or three days, and are not removed from the tree until they cease to yield. Good quality papain may fetch from 7 to 15*s*. per lb.; but the demand is limited and irregular.

Papain.

The term 'papain' is unfortunately applied both to the dried juice of the papaw and to an albuminous digestive ferment obtained from this by precipitation with alcohol. In commerce there are a number of preparations claiming to be the ferment of the papaw, sold as *papain*, *papayotin*, *papoid*, *caroid*, *vegetable pepsin*, etc. On examination several of these substances were found to be merely the dried and powdered latex of the papaw, bearing the same relation to the true separated ferment as the dried mucous membrane of the stomach might bear to purified pepsin. As confusion reigns supreme in the literature referring to this subject, and as, except for a possible question of degree, the properties and uses of the latex and the ferment are the same, no attempt has been made here to treat the two separately.

As it occurs in commerce, papain is a greyish, fine powder, which in appearance, odour, and taste strongly suggests pepsin. Its natural colour is light brown; but bleaching is commonly practised by manufacturers. In fact much sophistication obtains in the preparation of papain. The French product is usually mixed with starch which is added as a preservative. As starch, however, is not naturally present in the fruit, it rightly figures in the list of adulterants which also includes bread, arrowroot, the milk of

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the wild cactus, the milk of gutta percha, boiled rice, etc. Adulteration with boiled rice, to the extent of 10 per cent, is a clever Indian adulteration difficult to detect.

Papain, which acts as a digestant in acid, alkaline, and neutral media, is used to prepare foods for assimilation, and figures largely and prominently in foods for invalids and children, in chewing gums, etc. It is extensively used as a digestive in France and Germany, and has been given with good results to children. Nevertheless, the digestive power of the papaw falls greatly short of the claims made for it. It is commonly asserted that, when the stomach is acid, it is much superior to pancreatin, because its action is not markedly affected by contact with the acid; but in experiments made by Wood with a papoid from one of the most renowned manufacturers no digestion occurred, and it is probable that most of the article of commerce is inert. As a matter of fact many practitioners prefer to papain the milky juice fresh from the tree, which is not only more efficacious as a digestive, but is in addition a good taeniacide. It has been, moreover, shown that the bleaching of papain is a great mistake and that in a representative preparation the ferment action is most marked when all the proteins are associated together in the natural form.

'Acid glycerole of papain' is largely used in dyspepsia as it dissolves mucus in the stomach, which prevents the absorption of food in cases of indigestion, colic, flatulence, gastric ulcers; and it is also greatly recommended as an aid to the nutrition of patients suffering from phthisis. The liquid preparations are said to be suitable to reduce enlarged tonsils and adenoids, but unless there is some contra-indication to thorough surgical procedure, the practice is not particularly good. For this purpose a solution of 1 to 2 of papain in 10 each of glycerin and water is swabbed over the parts. A solution of this strength is used as an application to fissures and ulcers of the tongue; though lozenges are usually preferred for syphilitic ulcers of the tongue and throat. A stronger solution, 1 part of papain in 2 parts each of glycerin and water, is sprayed into the throat to dissolve false membrane, and is applied in compresses to warts to effect their dispersion and to malignant ulcers to cleanse them. It has even been used as a local application in epithelioma; but papain as a curative agent in cancerous affections has been unanimously found wanting. A 5 per cent solution with 2½ per cent of sodium carbonate is used as drops into the ear in chronic otorrhoea. For thread-worms papain, 5 or 10 grains in a half pint of water, may be thrown into the colon as high as possible. A pigment well rubbed is used to remove corns, warts, or any hardness of the skin, and in chronic eczema.

The proteolytic power of papain is exerted on living as well as on dead proteins, and injections into the tissues bring about topical destruction. Intravenously administered it destroys the blood cells and acts as a powerful poison. Injections into tumours have been made in the vain hope of destroying their vitality, but it has been used with more or less success for the removal of false membrane from the pharynx. Hypodermic injections in cases of elephantoid

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growth usually results in fever and intense local irritation pointing to the unadvisability of adopting such a mode of treatment.

For internal use papain may be encapsulated or dissolved or emulsified with glycerin and aromatics, a solution of this kind making an admirable vehicle for salicylates, mercurials, iodides, iron salts, and other medicaments that might irritate the stomach. It may likewise be associated with diastase or pancreatin and given about two hours after meals, or sooner if distress be felt. Like all the digestive ferments, it must be withdrawn after a short course, except in cases in which there exists some organic lesion from which recovery cannot be expected, and artificial digestion has become a constant necessity. It has no antiseptic power and even strong solutions will putrefy.

Pa-pay-ans.

In the words of Kilmer, 'the papaw has been brought to America as a cure for the national disease, dyspepsia'. Indigestion, to call it by its name, is one of the most unpleasant joy-killers to which the normally healthy man is subject. Unless it becomes too obnoxious, it is usually endured as an annoyance, and treated as a natural consequence of the daily routine. The sufferer means to reform his habits some day. His intentions are determined while an attack is on; but when the discomfort passes and temptation again beckons, forgetting all his good resolutions he fills himself with what Shakespeare calls 'the perilous stuff that weighs about the heart'. Hence the shelves of the chemists are replete with brands of pills, lozenges, tablets, powders, wines, and elixirs without end for 'removing flatulence, vertigo, weakness, and other symptoms of indigestion quickly and pleasantly' . . . and for 'promoting appetite, digestion, and the elimination of toxic and waste material'.

One such a drug is 'Pa-pay-ans (Bell)', the selling point of which was the supposed presence of papain. This ferment, Bell and Company alleged, was present in their tablets and they claimed it to be 'the digestive principle obtained by our own exclusive process from the fruit of *Carica papaya*'. As long ago as 1909, the Council on Pharmacy and Chemistry endeavoured to detect the presence of papain and to determine the digestive power of the tablets, but with negative results. The efforts of other chemists proved equally futile. Pa-pay-ans was essentially: charcoal, baking soda, ginger, and oil of wintergreen. And, consequently, the drug possessed the virtues—and they are few—and the limitations—and these are many—inherent to a mixture of baking soda, ginger, and charcoal.

In January 1914, Bell and Company changed the name of the product 'Pa-pay-ans (Bell)' to 'Bell-ans'. As the *Journal of the American Medical Association* remarked soon after, it seemed probable that, as the name of a nostrum of this kind is the manufacturer's most valuable asset, the name was hardly changed, as was alleged, for purely euphonious reasons. It seemed more likely that as analyses had indicated there was not, and probably never had been, any appreciable amount of papain in the product, the

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change of name might be due to the fear that some day the misleading name might bring the preparation in conflict with the Federal Food and Drugs Act.

Chemical Composition.

Upon standing for a few minutes the juice separates into two parts, an aqueous liquid and a white somewhat coagulated pulpy mass. In the aqueous portion is an albuminous substance possessed of enzymic properties, papain. According to the researches of Martin—and others—papaw juice contains besides papain, a water-soluble lipase, a lab or milk-curdling ferment, globulin, albumin, and two phytalbumoses. No peptones occur in the juice, but leucin and tyrosin are present.

The seeds contain a glucoside, caricin, which resembles sinigrin. They also contain the ferment myrosin, and by the reaction of the two a volatile pungent body is produced, smelling like oil of mustard.

The leaves have been reported to contain a glucoside, carposide.

The fruit contains vitamin C in abundance, with less of vitamin A, and still less of B.

An alkaloid, carpane, was obtained by Greshoff from the fruit and seeds, but especially from the leaves, of the papaw tree, and was afterwards studied by Merck, van Rijn, and Barger. According to Plugge, the alkaloid depresses the action of the heart and adversely affects respiration; whilst von Oefele recommends its application by subcutaneous injections as a substitute for digitalis in cardiac diseases. Chopra records that 'from the data already in hand, it is evident that it is not very toxic. A dose of 5 mgm., when injected intravenously in experimental animals, causes only a slight fall of blood pressure which, however, returns to the normal level within a very short time. The action of the heart is depressed and both the ventricles and auricles show evidence of slight depression. The respiration is not depressed to any great extent. The volumes of the different organs are very slightly affected, if at all. The alkaloid has not been used in therapeutics.'

Merck list carpaine hydrochloride as a cardiac tonic, and diuretic; for use in mitral insufficiency and aortic stenosis.

Commercial Possibilities.

By way of conclusion a few words may be said about the commercial and tradal prospects of either the papaw or papain. As far as the fruit is concerned its marketability depends evidently on three factors: transportation, demand, and supply.

The transportation question should not offer any difficulty as long as sufficiently large quantities can be procured for exportation from the plantation to the consumers. The art of transporting all kinds of fruit has reached such a degree of perfection, that there is no reason why the papaw should prove an exception to the rule as far as its preservation on board ship is concerned. In fact, successful experiments have already been made in this line between Honolulu and San Francisco.

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A far more doubtful factor is the creation of a market for the papaw from a consumer's point of view. The papaw is in no way superior, and perhaps not even equal, to the home-grown fruits of those continents where it would have to be marketed. In America, Australia, and Europe apples, pears, peaches, plums, cherries, apricots, and so on are more tasty than the papaw; and this would really be a case in which a liking for the fruit would have to be gradually developed among would-be consumers. Such an experiment is likely to prove expensive; its success may be slow in coming, if it comes off at all.

Besides this, suppose a demand for the papaw should eventually materialise, there is no guarantee that the grower could be able to provide the needed supply. This brings us to consider the question whether by any means the growers can increase their harvest of papaws according to the need of the market. From what has been said when describing the fruit-bearing capacities of the tree it follows that the grower is for ever facing the unknown. It seems to be all a question of luck whether the growing plant will prove useless or fruit bearing; and, as long as these circumstances prevail, the very idea of creating a market for the papaw is somewhat in the nature of a wild goose chase.

Finally as regards the commercial prospects of papain; the latter article being a medicinal drug with well defined therapeutic properties, it stands to reason that the market for papain will mainly be determined by the needs of manufacturers of pharmaceutical products. As was already pointed out, the demand for papain has, in fact, been both limited and irregular; and there is no likelihood of its ever becoming a widespread constantly used commercial commodity.

The United States of America, the largest consumer, import annually to the value of from £15,000 to £16,000. Ceylon is one of the principal exporters: from 1911 to 1913 the exports amounted to 6,111; 12,920, and 18,548 lbs. representing a value of 34,221; 50,668, and 71,849 rupees—numbers which in respect to quantity and value bear no comparison with other commercial commodities.

There is, therefore, very little hope of a prospective boom either in papaws or in papain.

Vernacular Names.

Adang: Adiba—; *Annam*: Du du, Phan qua thu, Trai du du—; *Arabic*: Aanabahe-hindi, Amba hindi—; *Ashanti*: Bororfere, Brorfenini, Brosownini—; *Awuna*: Adiba, Aduba, Yevudiba—; *Bengal*: Papeya, Pappaiya, Pepiya—; *Betsimisaraka*: Papay, Voapaza—; *Bombay*: Papai—; *Brazil*: Mamamoeiro, Mamao, Mameo, Mamerio, Mamoeiro, Papai—; *Burma*: Pimbosi, Simbosi, Thimbaw, Timbosi—; *Cambodia*: Lohong si phle, To hong phle—; *Canarese*: Goppe, Pangi, Pappayi, Parangi—; *Carib*: Ababai—; *Cochin-China*: Du du, Kay du du—; *Cutch*: Papaya—; *Deccan*: Popai—; *Egypt*: Babas—; *English*: Melon Tree, Papaw, Papaya, Papeta, Pawpaw, Tree-melon—; *Ewe*: Adiba—; *Fanti*: Borosow, Borosownyin—; *French*: Figuier des îles, Figuier des nègres, Melon

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des tropiques, Papayer, Papou—; *Fulah*: Budibaga—; *Ga*: Akpakpa—; *Gujerat*: Chibda, Erandakakdi, Jhadchibhadi, Kath, Papayi, Papia—; *Hausa*: Gwanda, Gwanda masar—; *Hindi*: Andakharbuja, Papaya, Pepiya, Popaiya, Urunkhurbooza—; *Konkan*: Popai—; *Krobo*: Gor—; *Kwang Tung*: Mou Koua—; *Laos*: Mak hung—; *Madagascar*: Mapaza, Paza—; *Malaya*: Papaya, Pohunbetek—; *Malayalam*: Kappalam, Karmmosu, Pappayam—; *Marathi*: Papaya—; *Maya*: Put—; *Mexico*: Chakarateca, Jacarata, Lechoso, Melon zapote, Papaya, Papaya los pajaros, Papayo—; *Mundari*: Ambritdaru, Amritdaru, Dindapabita, Jomejaradaru, Pabitadaru—; *Paraguay*: Mamon—; *Persian*: Aanabahe-hindi, Ambahindi—; *Philippines*: Capayo, Kapayo, Papaya—; *Portuguese*: Papaia—; *Punjab*: Arandkharbuza, Kharbuza—; *Samoa*: Esi, Esi fafine, Esitane—; *Sanskrit*: Chirbhita, Erandachirbhita, Malikadala—; *Sinhalese*: Copal, Cucaracho—; *Sind*: Chilbhado, Katha, Katha chibhadu, Paputa—; *Sinhalese*: Papaw, Pepol—; *Spanish*: Papaya—; *Tagalog*: Capayas—; *Tamil*: Pappali, Pappayi, Parangiyamanakku, Pasalai—; *Telugu*: Boppayi, Madananaba, Madhurnakamu—; *Tongking*: Du du—; *Tulu*: Bappangavi—; *Twi*: Brorfre—; *Urdu*: Erand-kharbujah—; *Uriya*: Omrytobhonda, Popoya—; *Visayan*: Capayas—; *Yemen*: Amba hindi—; *Yucatan*: Chich put, Put—.

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THE ORNITHOLOGY OF TRAVANCORE AND COCHIN.

BY

SÁLIM ALI.

With Notes by HUGH WHISTLER.

PART II.

(*With two plates*).

(*Continued from page 843 of volume* XXXVII).

SYSTEMATIC LIST.

FAMILY: CORVIDAE.

Corvus macrorhynchos culminatus Sykes. The Southern Jungle Crow.

Not collected by the Survey, but 9 specimens were kindly procured from the Trivandrum neighbourhood by the Superintendent of the Museum in connection with the revision of this form in the Eastern Ghats Survey. Mr. Whistler measures these as follows:

	Bill.	Wing.	Tail.
5 ♂♂	54.5-59	273-294	157-169.5 mm.
4 ♀♀	52-62	264-270	152-169 mm.

(The above measurements include adults and first year birds.)

Noted at: Santhanpāra (3,500 ft.—only once !), Thattākād (200 ft.), Neriāmangalam, Kotāmangalam, Kottāyam (ca. S.L.), Peermade (3,200 ft.), Kūmili (3,000 ft.), Periyār Lake Environs, Camp Derāmalāi (3,000 ft.), Rājampāra (1,350 ft.), Tenmalāi (500 ft.), Trivandrum (ca. S.L.), Cape Comorin (ca. S.L.), Arāmboli (250 ft.), Chālakūdi, Wadakkāncheri (400 ft.), Nemmāra (300 ft.), Trichūr, Karūpadanna (ca. S.L.), Ernakulam, Cochin Town.

The species was absent at Mūnnār (5,000 ft.), Balamore Estate (2,000 ft.), Kūriārkūtti (1,600 ft.) and Pādagiri (3,000 ft.). The last agrees with Kinloch's statement that it does not occur in the Nelliampathies at all. It was exceedingly rare at Marāiyūr (3,500 ft.), Santhanpāra (3,500 ft.), Peermade (3,200 ft.), Kūmili (3,000 ft.), Camp Derāmalāi (3,000 ft.) and Rājampara (1,350 ft.), only one or two examples being noted at each of these camps. It appears to avoid the hilly tracts and prefers the low country where it frequents the neighbourhood of towns and villages and is abundant, often to the point of being an unmitigated nuisance as any one who has had the pleasure of staying in the Trivandrum Dak Bungalow can testify. According to Ferguson (*J.B.N.H.S.*, xv, 255) the Jungle Crow does not frequent the hills in South Travancore, but is common at Peermade. During my camp at this place between 20 and 26 February I only saw a single example which also appeared as if it had urgent business elsewhere! It arrived from nowhere, perched on a tree-top for a few minutes and then disappeared.

In the Pālni Hills, Fairbank (*S.F.*, v, 407) does not appear to have seen it above Vilpati village, ca. 5,500 ft.

The race *culminatus* occurs throughout Ceylon, and birds from that island and from the Travancore-Cochin area appear identical in all respects.

Breeding: On 4 March (Periyār Lake Environs) an individual was observed carrying a twig in its bill, and another on 30 March was similarly occupied.

Ferguson gives the nesting season 'in the hills and also in the low country' as April to June. 'Bourdillon and others took eggs from 27 February to 20 May in Travancore' (*Nidification*, i, p. 9).

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In Ceylon Legge gives the breeding season as 'May, June and July, most nests being built in May' (*Birds of Ceylon*, p. 348). Wait on the other hand says the breeding season is 'from June till August' (2nd ed., p. 12).

Corvus splendens protegatus Madarász. The Ceylon House-Crow.

Specimens collected: 506 ♀ 2-4-33 Trivandrum (S.L.); 567 ♂ 11-4-33 Cape Comorin (S.L.); 737 ♂ 28-7-33 (Mārūthānkūzhi 50 ft.) Trivandrum Environs.

Elsewhere noted at: Thattākād (200 ft.), Neriāmangalam, Kotāmangalam, Kottāyam (S.L.), Wadakkāncheri (400 ft.), Nemmāra (300 ft.), Trichūr, Karūpadanna (S.L.), Ernakulam, Cochin Town.

Absent at: Marāiyūr (3,500 ft.), Mūnnār (5,000 ft.), Peermade (3,200 ft.), Kūmili (3,000 ft.), Camp Derāmalāi (3,000 ft.), Balamore Estate (2,000 ft.), Kūriārkūtti (1,600 ft.), Pādagiri (3,000 ft.). According to Kinloch (*J.B.N.H.S.*, xxvii, 939) it does not occur in the Nelliampathies at all.

Colours of bare parts: Iris brown; mouth brownish-slate; bill, legs, feet and claws black. Gape in juvenile pink.

[The series obtained by the Survey consists of one adult ♂ and two immature birds, and unfortunately I have been unable to supplement these with other Travancore specimens. There are none in the British Museum which has a very poor series of this common bird. The specimens measure:

	Bill.	Wing.	Tail.
567 ♂ ad.	55.5	284	169 mm.
737 ♂ imm.	53	253	146.5 mm.
506 ♀ imm.	46.5	259.5	156 mm.

The available series of *C. s. protegatus* in the B.M. consists merely of one pair of adults and one pair of immature birds. These measure:

	Bill.	Wing.	Tail.
♂ ad.	50.5	268	163 mm.
♂ imm.	49	235	131 mm.
♀ ad.	46.5	251	152.5 mm.
♀ imm.	45	220	130 mm.

In a variable species like the Crow—and the adult ♂ is much larger than the average of the House-Crows which I have measured—this series is not sufficient to settle whether Travancore and Ceylon birds are the same in size, though it suggests that the Ceylon bird is really smaller. In colour both series agree, and if the Travancore specimens are compared with specimens from the centre of the Peninsula, the difference in colour is most marked. Our Travancore specimens must therefore be considered to be *protegatus* unless and until evidence is forthcoming that Travancore birds definitely differ in size from those of Ceylon.—H. W.]

The House-Crow is a common and abundant species throughout the low country especially about towns and villages and in the neighbourhood of the homesteads and 'Kopra' depots along the backwaters. I found it most abundant in Trivandrum town, where its numbers are about equal to those of the Jungle-Crow. At Arāmboli it was noted as less numerous than the latter.

It is absent in the hills as will be seen from the above list of localities. In the Pālni Hills also, Fairbank (*S.F.*, v, 407) found it only at the base.

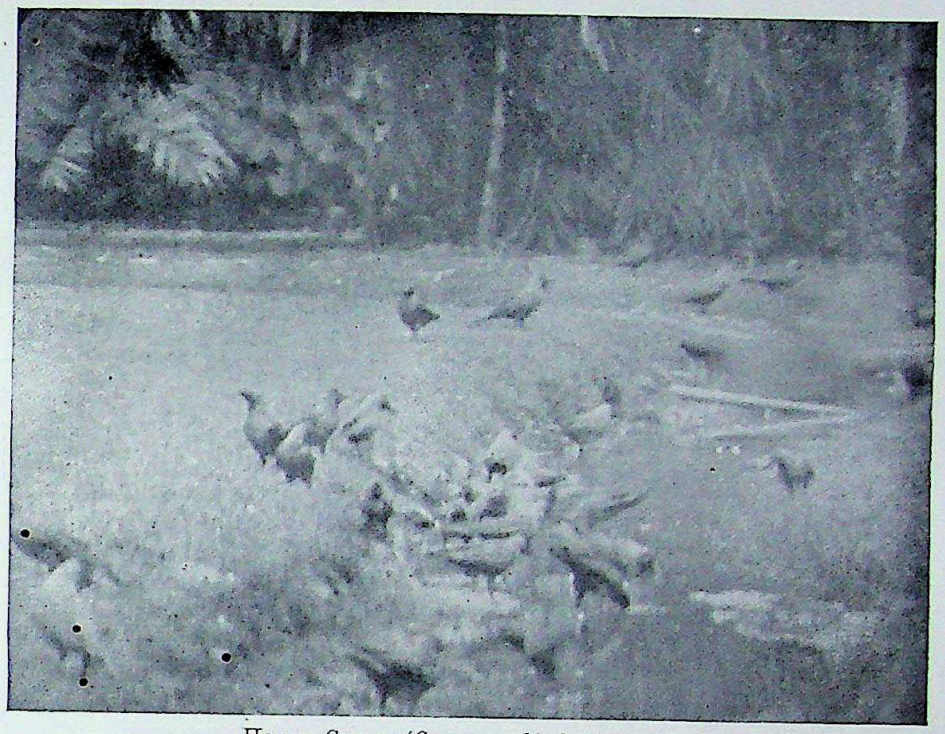
Breeding: As early as 31 January (Karūpadanna) a bird was observed feeding two full-fledged young with pink gapes, evidently lately out of the nest. On 15 February (Kottāyam) a nest containing 3 eggs was located at the base of the leaves of a small coconut palm, about 14 ft., standing on a bund among submerged backwater paddy-fields. Apparently brooding had not yet commenced. On 9 April (Cape Comorin) an individual was observed carrying a thorny twig into the top of a *Borassus* palm.

Specimen No. 567 (11 April) had one testis measuring 24×13 mm., the other being aborted and discoloured. It was observed that the bird had the leg on the side of the aborted testis missing from the tarsal joint.

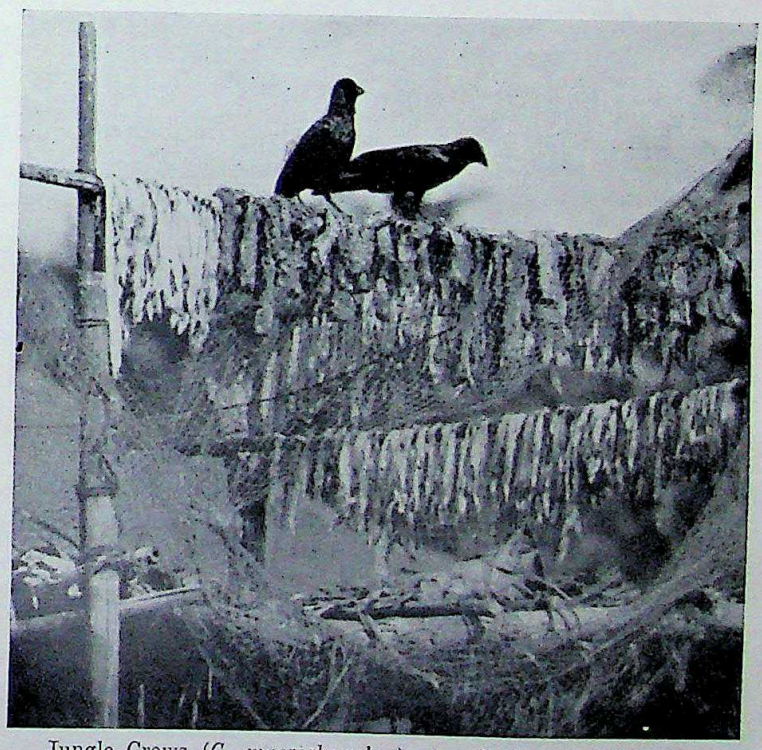
On 14 April (Cape Comorin) a nest was noted in a *Borassus* palm at about 25 ft. in which the young could be seen moving.

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House Crows (*Corvus splendens*) bathing.



Jungle Crows (*C. macrorhynchos*) at a backwater fish yard.

Photos by Author.

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T. F. Bourdillon was of opinion that in Travancore although they built in May and earlier, they hardly ever laid before June. The evidence obtained by the Survey does not bear him out; Ferguson also mentions taking eggs in the Public Gardens at Trivandrum as early as February, and it seems more than likely that the majority of young, at any rate, have left the nest before the first furious onslaughts of the S.-W. Monsoon in June.

According to Legge (*Birds of Ceylon*, p. 352) the breeding season in Ceylon is from May until July. Wait (2nd ed.) gives it as 'May to August, but mainly in May and June' (p. 13).

Dendrocitta vagabunda parvula Kinnear and Whistler. The Tree-Pie.

Specimens collected: 30 ♀ 7-1-33, 87 ♂ 13-1-33 Marāiyūr 3,500 ft.; 265 ♀ 11-2-33 Thattākād 200 ft.; 291 ♀ 16-2-33 Kottāyam 100 ft.; 411 ♂, 412 ♀ 6-3-33 Kūmili 3,000 ft.; 643 ♂ 21-4-33 Arāmboli 250 ft.; 706 ♂ 22-7-33 Trivandrum 100 ft.; 760 ♂ 31-7-33 (Marūthānkūzhi 50 ft.); 836 ♀ 11-8-33 (Pūlayanārkotta 200 ft.) Trivandrum Environs; 906 ♀ 26-11-33 Wadakkāncheri 400 ft.; 1026 ♂ 27-12-33 Karūpadanna ca. S.L.

Elsewhere noted at: Rājampāra (1,350 ft.), Cape Comorin (ca. S.L.), Chālakūdi, Nemmāra (300 ft.), Trichūr.

Absent at: Mūnnār (5,000 ft.), Santhanpāra (3,500 ft.), Peermade (3,200 ft.), Camp Derāmalāi (3,000 ft.), Balamore Estate (2,000 ft.), Kūriārkūtti (1,600 ft.), Pādagiri (3,000 ft.).

Colours of bare parts: Iris orange- to reddish-brown; bill slaty-black, paler at gape and chin; mouth slate colour; legs and feet brownish-slate; claws horny-brown or horny-black.

[Measurements:

	Bill.	Wing.	Tail.
6 ad. ♂♂	31-33.5	137-150	209-221 mm.
5 ad. ♀♀	29-31.5	131-144	196-204 mm.

With the exception of Nos. 411 and 412, the pair from Kūmili, which are rather pale, this series supports the division of South Indian birds into a pale race on the east and a dark race on the west, and the race *parvula* must undoubtedly be recognised. It only differs from the typical race in size, and of course intergrades with it.—H. W.]

The Tree-Pie is a common species in the low country, in open deciduous forest, and as Ferguson remarks, it does not (as a rule) ascend the hills, although at Marāiyūr (3,500 ft.) it was present in small numbers. Kinloch also found it in the Nelliampathies, but very rare (*J.B.N.H.S.*, xxvii, 939-44). In the hills this species is usually replaced by *D. leucogastra* as was the case in most of the localities where I have marked it absent. In localities like Thattākād and Rājampāra, where rubber plantations were surrounded by or alternated with tropical evergreen forest, both the Pies were met with side by side.

A favourite resort is rubber plantations of which there are several near Thattākād, between Kottāyam and Mūndakāyam, and elsewhere. The birds are also partial to the gardens of cocoanut, jack-fruit, mango, plantain and cashew which usually surround the homesteads by the backwaters and are such a feature of the countryside here.

Tree-Pies are invariably present among the localised associations of mixed bird species that move about in the deciduous forest in search of food, principally insects. In the evergreens their place is filled by *Dendrocitta leucogastra*, whose constant association with *Dissemurus paradiseus* has often been commented upon, e.g. by Kinloch in the Nelliampathies (*J.B.N.H.S.*, xxix, 294). As I have already pointed out in the report of the Hyderābād Survey (*J.B.N.H.S.*, xxxvi, 370) there is nothing mysterious about this association. It is merely the result of a convergence of interests which, as a rule, involves many other but perhaps less conspicuous species as well. The largest and most prominent members of such associations in dense evergreen jungle are usually the South Indian Tree-Pie and the Racket-tailed Drongo, and these two have naturally attracted the most attention from observers.

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Peepal figs (*Ficus religiosa*), when available, form an important item in the dietary of these birds, and they unfailingly resort to the trees to feed in mixed avian company. At Marāiyūr they were noted as partial to plantain (*Musa*) gardens, singly or in pairs, tearing off and feeding on the inflorescence and doing considerable damage.

Fairbank (*S.F.*, v, 407) obtained it at 5,000 ft. in the Pālni Hills.

Breeding: Specimen No. 291 (16 February) had a clearly granulated ovary with the follicles measuring 1 mm. in diameter.

Nos. 411 and 412 (6 March), a pair, were both carrying twigs for a nest in leafless deciduous jungle, and were obviously ready to breed. The testes of the male measured 9×5 mm. (slaty pigmented) while the largest ovarian follicle of the female was about 2.5 mm.

On 18 April (Arāmboli), H. took a clutch of 4 fresh eggs from a nest in a Neem tree at about 25 ft., in the Camp Shed compound. The nest was a flimsy structure of Babool and other twigs surrounding a shallow cup of finer twigs and rootlets through which the contents were visible from below. The eggs were very pale reddish-white in ground colour, sparsely speckled with light brown, and measured 27×21 (2), 26×21 and 26.5×21 mm.

The male of this pair, which had the central tail feathers missing (No. 643) was shot on 21 April. Its testes measured 9×5 mm. By 28 April, when the place was re-visited, the female had apparently provided herself with another mate and laid again (?), as one of the birds was observed to leave the nest on which it had been sitting!

On 21 April—by which date only pairs were in evidence and everywhere chivvying and chasing off Jungle Crows etc. from the neighbourhood of their territories—another nest was found in a *Thespesia populnea* tree, at about 12 ft., growing on a bund in a coconut plantation. It was similar in structure to the first and contained 5 eggs, also of the same type.

None of the other specimens showed any genital development.

From the evidence it appears that it is perhaps an earlier breeder on the whole than suggested by Ferguson's 'It breeds during the S.-W. Monsoon', i.e. between the middle of May and the middle of September, though some birds may of course do so during that period. It is significant also that none of the 3 specimens collected in the environs of Trivandrum in July and August show any departure in their gonads from the normal non-breeding condition, while two of the birds are even undergoing complete post-nuptial moult. The third (11 August) is immature in post-juvenal body moult. 'Bourdillon and Stewart found it breeding almost entirely in March and April, though a few birds continued to lay until the end of June' (*Nidification*, i, 33).

Dendrocitta leucogastra Gould. The Southern Tree-Pie.

Specimens collected: 200 ♀ 3-2-33, 266 ♂ 11-2-33 Thattākād 200 ft.; 456 ♂ 17-3-33 Rājampāra 1,350 ft.; 672 ♂ 26-4-33 Balamore Estate (2,000 ft.).

Elsewhere noted at: Santhanpāra (at 4,500 ft.), Kūmili (3,000 ft.), Camp Derāmalāi (3,000 ft.), Kūriārkūtti (1,600 ft), Pādagiri (3,000 ft.).

Colours of bare parts: Iris dark crimson; bill horny-black; mouth dark slate; legs, feet and claws blackish-brown.

[Other specimens examined:

Sparrow Coll.: ♀ 20-3-14 Cardamom Hills. Wings albinistic.

Brit. Mus. Coll.: ♀ 7-12-78, ♂♀ 18-10-78, ♂ no date, ♂ 27-11-74 Mynall, Travancore (Bourdillon); ♂ no date, Travancore (Bourdillon).

Bom. Nat. Hist. Soc. Coll.: ♂♀ 14-8-93 Thekadi, Travancore (J. P. Cook), ♂ 30-12-94 Ponnalore, Travancore (F. J. Inglish), ♂ -12-90 Ponmudi.—H. W.]

The Southern Tree-Pie is essentially a bird of evergreen rain forest and sholas, and completely replaces *D. vagabunda* in such biotope. In localities like Thattākād and Rājampāra, however, where there is a mixture of the two types of forest, with either preponderating in adjacent areas, both the species may occur side by side. Cardamom sholas are a favourite haunt; the birds—pairs or small parties—are very regular components of the localised bird associations in forest, of which *Dissemurus paradiseus* is another constant member, and *Tchitreā*, *Hypothymis*, *Culicicapa*, *Phylloscopus occipitalis*, *Sitta frontalis* and *Machlolophus* some of the usual but less obtrusive partners.

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The call-notes of this species are loud and more metallic than those of *D. vagabunda*, and often closely resemble those of its habitual companion the Racket-tailed Drongo. The bird has a habit of raising its tail and depressing the forepart till the body assumes a horizontal stance, and then of ludicrously bobbing or 'jumping' up and down on its perch as it utters a throaty 'chough-chough-chough' like some Japanese clockwork toy!

This Tree-Pie does not occur in Ceylon.

Breeding: In specimen No. 200 (3 February) the ovary appeared to be maturing, some of the largest follicles being about 2 mm. in diameter. No. 266 (11 February) had testes measuring 9×6 mm. and it was in freshly moulted immaculate plumage. No. 456 (17 March) from its narrow central tail feathers was apparently a first year bird with testes in normal non-breeding condition. No. 672 (26 April) had its testes enlarged to breeding size—8×6 mm.—and it had a prominent incubation patch.

Bourdillon states that its eggs may be obtained in March and the beginning of April at elevations of 2,000-3,000 ft. above sea-level. My notes tend to confirm this statement in the main, though perhaps February to April would be more correct. In suitable localities (cf. Thattākād, Rājampāra) however, it doubtless breeds at considerably lower elevations.

According to J. Stewart (quoted by Baker, *Fauna*, i, 52) it breeds in Travancore again in August, but of this I have no confirmation.

On p. 38, vol. i, *Nidification of Indian Birds*, Stuart Baker remarks on the similarity of the eggs of this Tree-Pie to those of the *formosae* and not the *vagabunda* group. Its closer relationship with the former is also confirmed by the immature plumage. First winter birds, which of course retain juvenile wings and tail, can only be distinguished from adults by the narrower, less spatulate tail feathers as in *formosae*, lacking the pale rufous tips of *vagabunda*. Mr. Whistler describes the juvenile plumage from a specimen in the British Museum as being exactly similar to the adult, save for the shape of the tail feathers and a slight brown fringing to the tips of the lesser wing coverts and rump.

Family: Paridae.

Parus major mahrattarum Hartert. The Southern Grey Tit.

Specimens collected: 90 ♂ 14-1-33 Marāiyūr 3,500 ft.; 380 ♀, 381 ♂ 1-3-33 Kūmili 3,000 ft.; 907 ? 26-11-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Rājampāra (1,350 ft.).

Absent at: Thattākād (200 ft.), Peermade (3,200 ft.).

Colours of bare parts: Iris brown; bill blackish-brown; mouth pinkish; legs and feet slaty-blue; claws horny brown.

[The Survey specimens measure:

	Bill.	Wing.	Tail.
4 ♂♂	11-11.5	61-66	52-55 mm.
1 ♀			

Further specimens examined:

Brit. Mus. Coll.: ♂ 16-3-95 Motachi-mali [?], S. Travancore (Bourdillon); ♂ 21-3-95 Mynall, Travancore (Bourdillon).

This race has an unusually wide range in India and Ceylon, yet no further subspecies can be made though in the South the central tail feathers are slightly blacker than in Rajputana. Travancore and Ceylon birds are inseparable.—H. W.]

This is a bird of open and light deciduous or secondary forest and avoids evergreen jungle. Small flocks or pairs were met with, usually among the localised bird associations. Rājampāra is the only locality where it was noted as fairly common.

In the Pālni Hills, Terry (*S.F.*, x, 478) found it in the Pittur Valley.

The Grey Tit is fairly generally distributed in Ceylon.

Breeding: Specimens Nos. 380 and 381 (1 March), a pair, were evidently breeding from the condition of their organs, presence of incubation patch and worn plumage. The testes of the ♂ measured 6×4 mm., the largest ovarian follicles in the ♀ being about 1.5 mm. They were hopping about on the ground among fallen leaves etc. in open deciduous forest, collecting nest-lining

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material. This would make it appear that the breeding season in Travancore agrees with that in the Nilgiris—February to May.

The main breeding season in Ceylon seems to be March to July.

Machlolophus xanthogenys travancoreensis Kinnear and Whistler. The Travancore Yellow-cheeked Tit.

Specimens collected: 134 ♂ 23-1-33, 141 ♀, 142 ♂? 24-1-33, 162 ♀ imm., 163 ?, 164 ♀ imm. 26-1-33, 178 ♀ 28-1-33 Santhanpāra 3,500 ft.; 425 ♂ 9-3-33 Camp Derāmalāi 3,000 ft.; 976 ♂, 978 ♂ 13-12-33 Pādagiri 3,000 ft.

Elsewhere noted only at Mūnnār (5,000 ft.), and as absent at Thattākād (200 ft.) and Peermade (3,200 ft.).

Colours of bare parts: *Adult*: Iris brown; bill (♂) horny-black or (♀) horny-brown; mouth pink; legs and feet bluish-grey; claws duskier. *Immature*: Gape yellow; commissure and tip of lower mandible whitish; mouth yellowish-pink; rest as in adult.

[Comparison of this fine series with the Eastern Ghats and Hyderabad Survey specimens—all fresh skins in which museum fading has not had time to take place—shows that the new race *travancoreensis* is a very good one. Compared with *aplonotus* the upper parts are a duller more saturated green, and the yellow of the lower parts is duller and more washed with olive green. The other differences in the wings noted in the original description (*J.B.N.H.S.*, xxxv, 519) are not confirmed as constant, but the white tips to the tail-feathers are smaller in *travancoreensis* than in *aplonotus*.

Mr. Sálim Ali has contributed to the problems connected with the plumages of the species as given under the above reference. Nos. 134, 142, 976 and 978 are all adult males with a glossy black crest and a broad glossy black ventral band, that is to say in the plumage commonly accepted as adult plumage for both sexes. Nos. 141 and 178 are both adult females, adult in the sense that the juvenile wings and tail have been moulted and the ovaries enlarged and granular. These birds have the green crest and olive-green ventral band already described (*loc. cit.*) from six specimens in the British Museum (marked ♂, ♀, ♀, ♀, two unsexed). As similarly mature females are found with black crests and black ventral stripes and there is no evidence to suggest that this species takes more than the customary 12 months of the genus to reach plumage maturity, one can only draw the conclusion that the females of this tit are dimorphic. If the ♂ (10-12-74 Mynall, Bourdillon Collection, British Museum) is correctly so sexed, the dimorphism must extend rarely to the adult males, but I suspect an error in sexing. This bird is not itself fully adult. In these green crested birds the black shaft-streaks in the crest are variable in size, being in one specimen almost wanting.

No. 425 is a male in juvenile plumage. It is black-crested and black-banded, differing from the adult male merely in the details usual to tits, viz., the crest is shorter and a duller less glossy black; the white spots on the median and greater coverts are washed with yellow, as are also the white outer webs of the tertiaries; the black ventral band is dull and restricted in size. Nos. 162 and 164 are both females in juvenile plumage. They are black-crested but have the olive-green ventral band as in the two adult females, that is to say they agree with the three juveniles of this form already described (*loc. cit.*) from the Nilgiris. None of these specimens have started their post-juvenal moult so we have no means of knowing whether these black-crested green-banded juveniles turn into green-headed green-banded adults or what. In *M. x. aplonotus* green-banded adult females have black crests and no green-crested female has been recorded. The dimorphism in the female plumage is evidently a racial characteristic of *M. x. travancoreensis*.

Further specimens examined:

Brit. Mus. Coll.: ♂ 4-6-77 Kodaikanal (Fairbank); ♂ ♀ 12-11-78 Mynall, Travancore (Bourdillon).—H. W.]

The Yellow-cheeked Tit was fairly common in hilly afforested localities, but absent in the low country. It was usually met with in pairs or small parties and almost invariably as a member of the localised bird associations which comprised besides of *Phylloscopus occipitalis*, *Culicicapa*, *Sitta frontalis* and other species, hunting for insects among the foliage of lofty trees such as may be found in cardamom sholas.

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Black-crested black-banded, black-crested green-banded and green-crested green-banded examples were frequently met in one and the same flock. Of a pair observed at Mūnnār on 16-1-33, one was black-crested black-banded, while in the other the crest and ventral band were greenish-grey. This was also the case with another pair at Santhanpāra (21-1-33) but in this case I am not sure whether the green-banded individual had a green or a black crest. At all events I never saw a pair or flock in which both or all the individuals were green-crested which precludes the suggestion of the green-headed birds belonging to a separate species and supports Mr. Whistler's conclusion that the females of this tit are dimorphic.

According to Kinloch (*J.B.H.N.S.*, xxvii, 939-944) the Yellow-cheeked Tit is extremely common in the Nelliampathy Hills. Bourdillon and Ferguson both record it to be a high elevation bird in Travancore, abundant from 3,000 ft. upwards. It is not found in Ceylon.

In the Pālni Hills Fairbank (*S.F.*, v, 407) found it sparingly at Kodaikanal and Terry (*S.F.*, x, 478) in small parties at Pulungi and Kukal.

Breeding: No. 976 (13 December) had testes measuring 7×5 mm. and had obviously just finished breeding as it was in post-nuptial moult (body and rectrices). It was accompanied by a green-banded green-crested (?) individual. No. 978 (14 December)—testes 6×4 mm.—was also undergoing post-nuptial moult, as also was No. 134 (practically completed 23 January) with testes 6×4 mm. Nos. 162 and 164 (26 January) were young birds with imperfectly ossified skulls, in juvenile plumage with the post-juvenal moult not yet started. They were of a family party of which No. 163 (in worn plumage, moult only just starting on breast) was presumably one of the parents. The latter was badly shot and could not be sexed. No. 178 (28 January)—green-crested green-banded—had a distinctly granular ovary and was undergoing complete post-nuptial moult. It was accompanied by a black-crested black-banded individual. No. 425 was also in juvenile plumage, with the post-juvenal moult not yet started.

There seems to be no recorded evidence of any nest having been taken in Travancore. Kinloch who found several nests in the Nelliampathies fails to give the dates. From the evidence obtained by the Survey, I would extend the breeding season in Travancore as suggested in the Eastern Ghats Report viz. 'July to August and possibly even later'—to the end of October or the middle of November.

Family: Sittidae.

Sitta frontalis frontalis Swainson. The Velvet-fronted Nuthatch.

Specimens collected: 182 ♀, 183 ♂ 29-1-33 Santhanpāra at 5,000 ft.; 390 ♂, 391 ♀ 3-3-33 Kūmili 3,000 ft.; 984 ♂ 15-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Marāiyūr (3,500 ft.); Mūnnār (5,000 ft.); Thattākād (200 ft.), Ūrūmbikera Res. Forest near Mūndakāyam (ca. 1,000 ft.), Peermade (3,200 ft.), Camp Derāmalāi (3,000 ft.), Rājampāra (1,350 ft.), Balamore Estate (2,000 ft.), Kūriārkūtti (1,600 ft.).

Colours of bare parts: Iris lemon-yellow; orbital skin yellow; bill coral red, brownish at tip; palate coral, gullet pink; legs and feet brown with orange tinge; claws horny-brown.

[Other specimens examined:

Brit. Mus. Coll.: ♂ 20-1-75, ♂ ?-10-78 Mynall, Travancore (Bourdillon); ♀ 21-6-77 Pālnis (Fairbank).

Bom. Nat. Hist. Soc. Coll.: ♂ 29-1-01 Devicolam, Travancore; ♂ 3-3-94 'Pulney Ghat' (J. P. Cook).

Sparrow Coll.: ♂ 21-3-14 Cardamom Hills.

Measurements:

	Bill.	Wing.	Tail.
12 ♂♂	16-17.5	77-80.5	39.5-43.5 mm.
4 ♀♀	16-17	75.5-80	39.5-42.5 mm.

The correct type locality of this species is Ceylon as was pointed out in the *Journal N. H. Society, Siam*, vol. v, pt. 3, p. 334 (1924) and this was

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accepted by Mr. Stuart Baker in his vol. vii, p. 25. It is unfortunate therefore that in *Nidification*, vol. i, p. 99, he has returned to the initial mistake of the *New Fauna*, vol. i, p. 132, of stating the type locality to be Java. It is not, therefore, as he says (*loc. cit.*, p. 99) a question of separating the Javan and Indian birds and using Hodgson's name *corallina* for the Indian bird, but a question of separating the Ceylon and Himalayan birds and using *frontalis* for the former and *corallina* for the latter. Our Travancore birds agree with those from Ceylon and therefore belong to the typical race.—H. W.]

This Nuthatch is essentially a bird of evergreen jungle and is found wherever this occurs in the Travancore-Cochin area, from almost the level of the low country to the highest sholas. It is usually met with in pairs running up and down the trunks or along and around the moss-covered branches of forest trees, frequently clinging back downwards and working along their undersides. They are regular members of the mixed hunting parties. I have only once observed them venture into open leafless deciduous jungle bordering an evergreen shola. This was such an unusual occurrence that the birds (Nos. 390 and 391) were mistaken for *Sitta castanea*, and promptly shot.

In the Pālni Hills both Fairbank (*S.F.*, v, 399) and Terry (*S.F.*, x, 472) found it common in the well-wooded portions and sholas.

This Nuthatch occurs throughout Ceylon, and Travancore and Ceylon birds are quite indistinguishable.

Breeding: Specimen No. 984 (15 December) had its testes enlarged to 7×4 mm. and was in fresh plumage. Of a pair, Nos. 182 and 183 (29 January), the ovary of the female was undeveloped while the testes of the male measured 3×2 mm. and appeared to be maturing. They were both completing a general moult. In another pair, Nos. 390 and 391 (3 March) the male's testes measured 7×4 mm.; the ovary of the female was distinctly granular, the follicles measuring about 1 mm. in diameter. A prominent incubation patch confirmed the presumption that the birds were breeding.

Apparently no nests have been recorded from Travancore or Cochin, but the breeding season here appears to be from December to March or thereabouts, and therefore somewhat earlier than that given for the Madras Presidency—February to April.

According to Davison the most normal breeding months in South India are April and May. In Ceylon 'Breeding season appears to be from February to May' (Waite, 2nd ed., p. 17).

Family: Timaliidae.

Garrulax delesserti (Jerdon). The Wynaad Laughing Thrush.

Specimens collected: 179 ♂, 180 ♂ juv. 29-1-33 Santhanpāra at 5,000 ft.; 273 ♀, 274 ♂ imm. 12-2-33 Thattākād 200 ft.; 675 ? 27-4-33 Balamore Estate 2,000 ft.

Elsewhere noted at: Tenmalāi (500 ft.), Pādagiri (3,000 ft.).

Colours of bare parts: *Adult*: Iris scarlet ('maroon-brown' according to Kinloch); gape and upper mandible dark horny-brown, lower mandible pale yellowish flesh-colour; palate yellow, gullet pink; legs, feet and claws pinkish flesh-colour with grey tinge. *Juvenile* and *Immature*: (Nos. 180 and 274) Iris pale pinkish-buff; upper mandible horny-brown except tip, nostrils, lores and a spot on culmen near forehead, which yellow; gape and lower mandible bright yellow; eyelids bright yellow; orbital skin and aural opening paler yellow; legs and feet dusky yellow; claws paler.

In No. 675 (age ?) Iris brownish-orange; upper mandible horny-brown, lower mandible pale yellow or cream; a bare post-orbital patch bluish-slate; legs and feet dirty brownish-grey; claws creamy-white.

[The Survey specimens measure:

	Bill.	Wing.	Tail.
3 ♂♂ ad. and imm.	30.5-31	100-108	99-102 mm.
1 ♀	31.5	108.5	101 mm.

Further specimens examined:

Brit. Mus. Coll.: ♂ 8-1-73 Assambo Hills; ♀ 30-12-94 Bonacaud, Travancore (A. N. Nair); ♀ 27-4-74 Mynall (Bourdillon).

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Stuart Baker says (*New Fauna*, vol. i, p. 149 and *Nidification*, vol. i, p. 111) that this Laughing Thrush is confined to the hills of South-West India from the Wynaad to South Travancore. This distribution is manifestly incorrect as in the next paragraph he goes on to quote the discovery of the nest by John Davidson in North Kanara. It is, as a matter of fact, common almost throughout the hills of North Kanara (Davidson, *J.B.N.H.S.*, xi, 655) and South Kanara (Bell apud LaPersonne, *J.B.N.H.S.*, xxxvi, 503).

The juvenile plumage does not appear to be represented in any collection, but from specimen No. 180 which is in post-juvenal moult, it is evident that the juvenal plumage is—as one would expect—very similar to that of the adult. It, and therefore the first winter bird (No. 274), show the normal differences of young Timaliine birds, namely a soft blunt first primary and narrow pointed tail-feathers. As the breeding season is evidently late in the heaviest part of the monsoon the post-juvenal body moult is taking place about January-February. The adult post-nuptial moult therefore is probably about November-December, but no specimens have been seen.—H. W.]

This Laughing Thrush is also confined to the heavy rain-forest areas of Travancore-Cochin. The Surveys came across it from almost the level of the low country (Thattākād 200 ft.) to about 5,000 ft. in the Cardamom Hills at Santhanpāra, and it probably occurs, as Ferguson says, at all elevations. It goes about in noisy flocks of 6 to 10 birds, keeping principally to the dense cane-brakes and evergreen undergrowth, preferably on the edge of footpaths and cardamom clearings, where they rummage among the fallen leaves and mulch in search of insects, in the manner of the family. They are great skulkers when alarmed, and give vent to a variety of squeaky shrieks as they scuttle away from danger.

This Laughing Thrush is not found in Ceylon.

Breeding: Specimen No. 179 (29 January) had testes measuring 10×6 mm. (slaty pigmented). No. 180, a member of the same flock, was juvenile with very imperfectly ossified skull and in heavy post-juvenal body moult. It was probably not more than 1-1½ months old. No. 273 (12 February) had a mature ovary, the largest follicles measuring about 2 mm. in diameter, and the bird was in worn breeding plumage. It was of a flock from which also was secured No. 274, an immature ♂ with partially soft skull and in heavy general moult in which the tertiaries were also involved. No. 675 (27 April) was undergoing a body (post-nuptial ?) moult.

It would appear from the above that the breeding season in this area is somewhere between December and the first two or three months of the year. What is more probable, however, is that as in some of the other members of this family, it is rather erratic and ill-defined. Ferguson says that it breeds in June. He quotes the description of a nest found by T. F. Bourdillon (*J.B.N.H.S.*, xv, 257) but omits to give the date.

Stewart took nests and eggs in the Ventura Valley, Travancore, from 7 April to 28 August. According to him, it breeds principally during the South-West Monsoon when the rainfall is about 150 inches. Normal c/3 or c/4, but 2 nests contained 6 and 7 eggs each presumably laid by 2 hens (*Nidification*, i, 111).

T. R. Bell says (apud LaPersonne, *J.B.N.H.S.*, xxxvi, 503) that in Kanara it invariably nests in or on 'Karvi' (*Strobilanthes*) stems and nearly always in the monsoon months—July to September—in anything from 250-350 inches rainfall.

Trochalopteron jerdoni fairbanki Blanford. The Travancore Laughing Thrush.

Specimens collected: 19 ♀ 6-1-33 (4,500 ft.), 57 ♂, 58 ♀, 59 ♂ 10-1-33 (7,000 ft.) Marāiyūr; 101 ♀ 17-1-33, 106 ♂, 107 ♂, 108 ♀ imm. 18-1-33, 117 ♂ 20-1-33 Mūnnār 5,000 ft.; 145 ♂ 24-1-33 (4,500 ft.), 181 ♀ 29-1-33 (5,000 ft.) Santhanpāra.

Not met with elsewhere.

Colours of bare parts: *Adult*: Iris reddish-brown; bill horny-brown; mouth pink; legs and feet slaty-brown; claws brown; soles of feet greyish-yellow. *Immature* (No. 108): Iris brown; mouth pale yellowish-pink; rest as in adult.

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[The Survey specimens measure:

	Bill.	Wing.	Tail.
6 ♂♂	21.5-23	82.5-89.5	85.5-93 mm.
5 ♀♀	19.5-23	83-86	86-91 mm.

(The above include both adult and immature birds.)

No. 108 is still in juvenile plumage and is similar to the adult except that the crown and nape are not so dark, contrasting therefore less with the mantle. The shape of the first primary and tail-feathers is rather variable in this species, making it more difficult to distinguish by them adults and first-year birds—doubtless another manifestation of the plastic nature of this species which has produced three races in a small area.

Of the series obtained, two adults are in complete moult in January which suggests that the breeding season must extend later than 30 May as given in *Nidification,* vol. i, p. 140.

The distribution of this species was given wrongly in the *New Fauna* (vol. i, p. 178), South Travancore having been erroneously mentioned instead of the High Range of North Travancore. It is again incorrect in *Nidification* (vol. i, p. 139) where the Travancore area is totally omitted!—H. W.]

The Travancore Laughing Thrush is a bird of high elevations, never in my experience met with below 4,000 ft., and thence up to the highest limits of suitable biotope. As I have pointed out elsewhere, they appear to be inseparable from the facies in which the wild Raspberry plant (*Rubus*) grows—in Travancore also from an elevation of about 4,000 ft. up. Whenever this elevation was reached and *Rubus* appeared, I invariably found *Trochalopteron;* nowhere below. They move about in flocks of 6-10 birds, frequenting dense scrub and undergrowth, preferably bordering hill streams. When alarmed, the birds utter a low 'wit-wit-wit' and disappear through the undergrowth like *Dumetia*, rarely showing themselves. They are inveterate skulkers and can seldom be made to leave cover even when pelted at with stones. The alarm notes or squeaky shrieks are similar to those uttered by *Turdoides somervillei,* but louder and somewhat shriller.

These thrushes were extremely common at Mūnnār (5,000 ft.—Kannan Dēvan Hills) where they kept to the scrub of *Rubus* and bracken bushes lining streams and nullahs through the extensive tea plantations, and on the outskirts of the town. At Santhanpāra (above 4,000 ft.—Cardamom Hills) they were partial to the dense growth of Eeta (*Ochlandra travancorica*) and secondary jungle bordering cardamom cultivation among the higher hills. They are very fond of the berries of *Macsa perrottetiana* D.C. and *Trema orientalis* Blume which comprised a large portion of their food at this season.

The statement of Ferguson's that this race is found from the Achankovil Gap (lat. 9°5′ N.) northwards through the High Range into the Ānnemalais and Pālnis is probably correct, though I was unable to verify the exact limit of its southern distribution. Kinloch does not record it in the Nelliampathies, neither did I come across the birds in these hills during the Cochin Survey. However, I never seem to have struck the required *Rubus* facies though the hills up to about 4,500 ft. were worked fairly thoroughly. In the Ānnemalai Hills about Kūriarkūtti, both *Rubus* and *Trochalopteron* were absent to an elevation of about 3,800 ft.

Both Fairbank (*S.F.*, v, 404) and Terry (*S.F.*, x, 475) found this Laughing Thrush very common in the shōlās above 5,000 ft. in the Pālni Hills. It is said to damage peaches and raspberries at Kodāikānal.

This species is not represented in Ceylon. It must be far more sedentary than most to have attained the unusual distinction of producing three races within so small an area of South-West India, and to be represented by a distinct species in the Nilgiris.

Breeding: Specimen No. 108 (18 January) was an immature bird with very soft skull and in juvenile plumage with some feathers still ensheathed and growing. It was probably not more than 1½ months old. An adult male on the same date was in worn breeding plumage with testes measuring 5×3 mm.

Specimen No. 181 (29 January) on the other hand, was in fresh plumage with a firm and granulated ovary in which the follicles measured about 1 mm.

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in diameter. It was, moreover, one of a pair and presumably preparing to breed.

From the evidence, I am inclined to the opinion that the breeding season in the Travancore-Cochin area at any rate, is far from well-defined and extends over the greater part of the year except perhaps the two or three months of heaviest rainfall. Possibly, of course, some months as between March and June may be more favoured than others.

Terry gives the following records of nests found by him in the Pālnis: c/2 fresh eggs, 30 May, Kodāikānal; c/2 fresh eggs, 20 May, Kukal; c/1 very hard set, 6 June, 2 young birds about a week old on 8 June.

Trochalopteron jerdoni meridionale Blanford. Blanford's Laughing Thrush.

Specimens collected: 667 ♂ juv., 668 ♀ juv., 669 ♂ imm., 670 ♂ 25-4-33 Mūthūkūzhi 4,000 ft. (Ashambū Hills).

Elsewhere not met with.

Colours of bare parts: *Adult* (No. 670): Iris crimson; bill horny-brown; mouth pink; legs and feet brownish-slate; claws horny-brown; soles yellow. *Immature* (No. 669): Iris olive-brown; mouth pinkish-yellow; rest as in adult. *Juvenile* (Nos. 667, 668): Iris olive-brown; bill horny-brown except commissure and extreme tip, which yellow; gape and mouth bright yellow; legs, feet and claws as in adult.

[It may be useful to summarise from fresh specimens the differences between this and the last form:

T. j. fairbanki.	*T. j. meridionale.*
1. Crown and nape dark sooty brown, in some specimens almost blackish, remainder of upper plumage wings and tail olive-brown, contrasting with the crown and nape.	1. Crown, nape, upper parts, wings and tail dull sooty greyish-brown throughout with no contrast between them.
2. Supercilium long, broad, clearly defined and pure white. Below it a blackish stripe through the eye from the lores, contrasting with the grey cheeks.	2. Supercilium short, narrow, ill-defined and mostly grey. Blackish stripe below only distinct on the lores.
3. Chin, throat and breast more grey than white. Centre of abdomen rufous, a little paler than the flanks.	3. Chin, throat and breast more white than grey, the white extending down the centre of the abdomen to the vent.

Further specimens examined:

Brit. Mus. Coll.: 3 from Mynall (Bourdillon); 1 from Ponmūdi 3,500 ft. (Ferguson and Nair); 1 from Colathorpolay (Kolāttūpūzha) 3,800 ft., Patnas (Hume Collection); 7 from Chimpani (Davidson).

In *Nidification* (vol. i, p. 140) the mistake of attributing those localities to North Travancore (which would mean that the 2 races *fairbanki* and *meridionale* were found together) made in the *New Fauna* (vol. i, p. 179) is repeated inspite of its having been corrected in *J.B.N.H.S.*, xxxv, 524!—H. W.]

This race replaces *fairbanki* in the hills of South Travancore—according to Ferguson from the extreme south to the Achankovil Gap. The exact limits of its range have not been determined by the Survey. In haunts and habits there is no difference to record from the last.

Breeding: Nos. 667 and 668 (25 April) from the same flock and apparently of the same brood, had very soft skulls (cf. also colours) and were in juvenile plumage which is evidently similar to that of the adult. I estimate that they were about a month old. No. 669 was slightly older, aged perhaps 1½-2 months, and No. 670, in spite of the size of its testes (8×5 mm.) was undergoing complete post-nuptial moult.

Ferguson says: '. . . as I shot a young bird in March just out of the nestling plumage, I conclude that the breeding season is about May and June'. It is difficult to follow his line of argument, but the Survey specimens suggest

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that in March breeding is certainly in progress. Like the foregoing, however, it may also breed over other months of the year.

Two clutches found by Mr. J. Stewart on 10 June 1906 and 4 June 1912 (at 3,000 ft. in thick evergreen forest) are recorded in *Nidification*, i, 140. There may, however, be some mistake over the identity as the eggs are described as being not like those of the foregoing form, but exactly like those of the Nilgiri Blackbird!

Turdoides somervillei malabaricus (Jerdon). The Malabar Jungle Babbler.

Specimens collected: 234 ♀ 7-2-33 Thattākād 200 ft.; 864 ♀ 14-11-33, 889 ♀ 21-11-33 Kūriārkūtti 1,600 ft.; 901 ♀ Wadakkāncheri 400 ft.; 1029 ♂ Karūpadanna ca. S.L.

Elsewhere noted at: Marāiyūr (between 3,500 ft. and 4,500), Kottāyam (ca. S.L.), Kūmili (3,000 ft.), Rājampāra (1,350 ft.), Tenmalāi (500 ft.).

Noted as absent at: Santhanpāra (3,500 ft.), Trivandrum and Cape Comorin (ca. S.L.), Aramboli (250 ft.).

Colours of bare parts: Iris creamy- or yellowish-white; bill and circumorbital skin pale yellow; gape and mouth bright deep yellow; legs, feet and claws pale yellow.

In this species the bright colour of the juvenile gape persists in the adult, and the mouth also retains to a large extent the conspicuous juvenile colouring.

[The Survey specimens measure:

	Bill.	Wing.	Tail.
1 ♂	24	107.5	105 mm.
4 ♀♀	24-24.5	101-107	99-101.5 mm.

This species is not represented in the British Museum by any specimens from Travancore and at the time of writing my report on the birds of the Eastern Ghats Survey I had seen no specimen from that State. I had therefore no reason to differ from the commonly accepted view that only one race of this Babbler—*T. s. malabaricus*—was found in Southern India. The five specimens procured by the Travancore-Cochin Surveys clearly show that view to be wrong. When they are compared with the fine series obtained by the Eastern Ghats Survey it is seen that the upper parts are a darker richer brown, particularly noticeable on the rump, upper tail coverts and tail. The lower plumage also is darker and more richly coloured throughout, the fulvous wash on the breast and abdomen being deeper and more richly coloured. It is, therefore, necessary to establish which of these two South Indian forms should rightly bear the name of *malabaricus* and whether any other name is available for the other. Luckily there is no difficulty about the matter.

Jerdon described his *Malacocercus malabaricus* from the 'forests of Malabar, and on the sides of the Neilgherries up to the very edge of the Hills'. It is never quite clear what is meant by the 'Malabar' of the older writers, but Jerdon's use of the term in many cases, and evidently in this case too, often refers to Travancore where indeed he had been previous to the publication of this name. The matter is made clearer from his description at the same time of another new form *Malacocercus orientalis*[1]. Jerdon described it as 'found in the jungles of the Carnatic, and more especially amongst those of the Eastern Ghats, where it is very abundant, whence the name I have proposed'.

The difference of colour between *malabaricus* and *orientalis* given in the description shows that Jerdon in these two names was deliberately describing the two South Indian forms now obtained by the Surveys. He also made it clear that neither had anything to do with the *somervillei* of Sykes and Bombay.

Blyth, no doubt, later suggested to Jerdon that his two forms were based on individual differences, for in the *Birds of India*, vol. ii, p. 63, the latter says in 1863: 'In my "Illustrations" I separated those from the Eastern

[1] This name in the *New Fauna*, vol. vii, p. 36, for some reason is placed as a synonym of *Turdoides terricolor terricolor* (rectius *T. somervillei terricolor*) but there the type-locality is omitted and the type-locality alone is sufficient to show that the attribution is wrong.

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Ghauts under the name of *M. orientalis*. This race, however, has not been considered distinct from *malabaricus*, and I have accordingly merged it in that species. Malabar specimens appeared to me to have more rufous; those from the Eastern Ghauts more grey.'

Our Travancore-Cochin series, therefore, represents the true *malabaricus* of Jerdon. The better-known race of the Jungle-Babbler found throughout the greater part of the Madras Presidency, and hitherto known as *malabaricus*, must in future be known as *Turdoides somervillei orientalis* Jerdon (*Ill. Ind. Orn.*, text to pl. 19, 1845 (March), type-locality: Eastern Ghauts), and under that name, therefore, should be listed all the specimens listed as *T. s. malabaricus* on p. 378 of the *J.B.N.H.S.*, vol. xxxv, Eastern Ghats Survey, and on p. 373, vol. xxxvi, Hyderābād Survey.—H. W.]

The Jungle Babbler is a common bird in the Travancore-Cochin area, though patchily distributed. Flocks frequent deciduous and bamboo forest or scrub jungle with Lantana etc., where they rummage among the fallen leaves for insects. It avoids evergreen jungle, but may sometimes be met with in the secondary growth on its outskirts. The flocks habitually form the nucleus of the localised bird associations and are seldom met independently of them. They are also partial to the neighbourhood of homesteads along the backwaters, frequenting the mango, jack-fruit and cashew gardens, often in association with *Turdoides striatus*. As I have remarked before in the Hyderābād Survey Report (*J.B.N.H.S.*, vol. xxxvi, p. 373) my experience does not bear out the statement on p. 737, vol. xxxv, that it does not mix with the White-headed Babbler. It is true that as a rule the two species inhabit different facies, but where these overlap, the birds may frequently be seen in association with each other and with other avian species.

A flock at Marāiyūr (14 January) was noted in my field-book as composed of particularly rufous tinged individuals, very reminiscent of typical *somervillei* of Bombay. The rufous colour was no doubt accentuated by some peculiarity in the lightning conditions, but its presence is now confirmed and explained by Mr. Whistler's note.

A habit with this species when curious or agitated, is to fluff out its plumage especially that of the back which assumes an arched appearance, droop the wings at the sides, spread and depress the tail and pivot uneasily from side to side, peering at and chivvying the intruder the while.

As pointed out in the Eastern Ghats Report (*J.B.N.H.S.*, xxxv, 738) the statement in the *Fauna* (vol. i, p. 195) that *T. s. somervillei* occurs from Travancore to Bombay along the West Coast is apparently based only on wrong identification of the ferruginous stained specimens of *T. striatus poliocercus* obtained at Kolachāl (Travancore).

In the Pālni Hills, Fairbank (*S.F.*, v, 405) found it common at the base and in thin jungle on the sides up to 4,500 ft. He procured a ♂ at Vengayam Parry on 1 June. Terry (*S.F.*, x, 475) describes it as rather rare at Pulungi, but very common lower down on the slopes and in the Pittur valley.

It does not occur in Ceylon, where according to Whistler (*J.B.N.H.S.*, xxxv, 738) *T. striatus striatus* represents both the Jungle and White-headed Babblers and is a connecting link between them.

Breeding: No. 234 (7 February) had a mature ovary with follicles measuring 1-1.5 mm. In No. 1029 (27 December) the testes were enlarged to 7×5 mm., and both these individuals were either breeding or ready to breed. The specimens obtained in November and December were not in moult. A ♀ (7 February) had slight traces of moult on head and neck.

The above specimens suggest December to February as being at least part of the breeding season in the Travancore-Cochin area. The probability, however, is that it breeds irregularly more or less throughout the year as in other parts of the range of the species.

Bourdillon and Stewart record January to March as the principal breeding months in Travancore though they also say that breeding is fitful and very irregular. In the Nelliampathy Hills (Cochin) A. P. Kinloch took most nests in bamboo clumps in mixed scrub and bamboo jungle, often at considerable elevations (*Nidification*, i, 154). No date!

In the Pālni Hills, Terry (*S.F.*, x, 475) records nests as follows: c/3, incubated, 5 April—Pulungi; c/2, incubated, 6 April—Pittur Valley.

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Turdoides striatus polioplocamus Oberholser. The White-headed Babbler.

Specimens collected: 13 ♂ 5-1-33, 86 ♀ 13-1-33 Marāiyūr 3,500 ft.; 504 ♀, 505 ♀ 2-4-33 Trivandrum ca. S.L.; 533 ♀ 8-4-33 Cape Comorin ca. S.L.; 569 ? naked chick ex nest 11-4-33; 610 ♀ 17-4-33 Arāmboli 250 ft.; 683 ♀ imm. 17-7-33 (Pattom 50 ft.); 723 ♀ 25-7-33 (Thirūmalāi 120 ft.); 813 ♀ 8-8-33 (Mūkūnnimalāi 800 ft) Trivandrum Taluk; 908 ♀ 26-11-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Chālakūdi, Nemmāra (300 ft.), Trichūr, Karūpadanna ca. S.L.

Colours of bare parts: *Adult*: Iris from creamy- or greyish-white to pale sky blue; bill, legs, feet and claws pale sickly yellow; mouth pale pinkish-yellow. *Immature* (No. 683): 'lower mandible, legs, feet and claws greyish-white' (Pillai).

[The Survey series measure:

	Bill.	Wing.	Tail.
1 ♂	20.5	108.5	103 mm.
9 ♀♀	19-23	99-110.5	97-109 mm.

The specimens definitely belong to this form and not to the Ceylon race, which appears to be intermediate between this bird and the Jungle Babbler, connecting them.

This species has normally a complete post-nuptial moult which takes place from June to November. In practice, however, the body moult seems to be carried out in such an irregular and dilatory fashion that some feathers are being moulted all the time and practically no bird will be found with all feathers in the same state of freshness or wear. The red patches, found on some specimens, appear to have nothing to do with erythrism but to be due to the combined effects of wear and bleaching and staining.—H. W.]

The White-headed Babbler was met—with one exception, Marāiyūr—only in the low country and about the lower foot-hills in the comparatively drier localities of the States, chiefly in the precincts of villages and human habitations. It was common everywhere. In the gardens about the backwater homesteads near Karūpadanna, and in the scrub and secondary jungle surrounding the camp-shed and the terraced paddy fields at Marāiyūr, it was frequently found in association with *T. s. malabaricus*. Its food consisted to a large extent of the berries of *Lantana camara*, a species which everywhere was a conspicuous feature of its biotope.

Breeding: Specimen No. 13 (5 January) had testes measuring ca. 5×3 mm. and apparently developing. Nos. 504 and 505 (2 April) both had mature ovaries with follicles 1-1.5 mm. in diameter. No. 533 (8 April) had apparently lately finished breeding. Its ovary was as yet conspicuously granular; the plumage was worn and an incubation patch present. It was accompanied by another adult bird and a full-fledged young. On the same date Humayun observed pair feeding a ¾ grown *Clamator jacobinus*. On 11 April (Cape Comorin) he took a naked chick (No. 569) from a nest in a Babool tree (at about 5 ft.) which contained 3 others in the same stage. On 15 April a nest containing 4 eggs was found in a branch of an *Acacia planifrons* (at 12 ft.) overhanging a dry sandy nullah on the edge of a patch of Babool jungle in the Arāmboli Gap. No. 683 (17 July) was a young bird with soft skull, while No. 813 (8 August) had the largest ovarian follicle measuring about 3 mm. and was evidently breeding.

Stewart took nests in Travancore as early as February (*Nidification*, i, 156). Ferguson (*J.B.N.H.S.*, xv, 258) says that *striatus* breeds in Travancore in April and May while *griseus* (obviously referring to the same bird) does so in June. From the evidence collected by the Survey, however, the breeding season appears to be as ill-defined as in the case of some of its nearest relatives. It is possible that as elsewhere in the Madras Presidency (*J.B.N.H.S.*, xxxv, 740) the majority of eggs are laid between March and July.

Argya caudata [caudata] (Dumont). The Common Babbler.

No specimens were obtained by the Surveys, but there is one (labelled *Crateropus striatus* !) in the Trivandrum Museum with the data 'Arāmboly,

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Travancore, 14-6-10'. From the fact, however, that the label is not original and quite new, Mr. Whistler is of opinion that this cannot be accepted as an authentic record in the absence of any other confirmation from Travancore. He thinks that probably the specimen came from elsewhere and there was some msitake during re-labelling.

Arāmboli is the western (Travancore) extremity of a gap or pass through the barrier of hills that form the boundary between the Madras district of Tinnevelly and the Travancore State. It is in effect a miniature repetition of the Pālghāt Gap on the northern frontier of Cochin, and like it, functions as a channel of exchange for many plant forms between the two areas for some distance on either side. Through this gap also there was noted an extension into Travancore of *Lanius vittatus*, not met with elsewhere within the area, and it is readily conceivable that *A. caudata* may do so in the same way.

Fairbank (*S.F.*, v, 405) found the Common Babbler plentiful at the base of the Pālni Hills and there seems no biological reason why it should not extend southward thence through the Rāmnād into the Tinnevelly District, and thence through the pass to Arāmboli where the facies is of a character eminently suited to it.

While the Survey was working this area, I have a record in my diary that *Argya caudata* was heard. By itself this note would have been valueless and I should probably have omitted it but for the support now accorded by the Trivandrum Museum specimen. In my opinion the two records confirm each other sufficiently to be accepted until definite information to the contrary is forthcoming.

Argya malcolmi (Sykes). The Grey-headed Babbler.

Not met with by the Surveys.

In the Pālni Hills Terry (*S.F.*, x, 475) met it once 'far down the slopes towards Pulney'. The record is vague and gives no idea of the exact locality or the facies in which the birds were seen.

Breeding: 'Bourdillon obtained several nests in Travancore where, however, he says it is not common. . . In Nilgiris and Travancore, most eggs are laid in March . . .' (*Nidification*, i, 162).

I consider that the occurrence of this Babbler in the Travancore-Cochin area needs confirmation.

Argya subrufa (Jerdon). The Rufous Babbler.

Specimens collected: 139 ♂ 24-1-33 Santhanpāra 3,700 ft.; 361 ♂ 25-2-33 Peermade 3,200 ft.; 696 ♀ (juv.) 20-7-33, 799 ♂ (juv.) 6-8-33 (Thirūmalāi 120 ft.) Trivandrum Taluk; 869 ♂ 15-11-33 Kūriārkūtti 1,600 ft.

Elsewhere noted at: Marāiyūr (3,500 ft.), Thattākād (200 ft.), Kottāyam (at ca. 100 ft.), Kūmili (3,000 ft.), Rājampāra (1,350 ft.), Tenmalāi (500 ft.), Balamore Estate (2,000 ft.), Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: *Adult and Immature* (No. 799): Iris creamy-white; upper mandible dark horny-brown except at gape; lower mandible, gape and mouth bright yellow; legs and feet dusky-yellow or yellowish-brown; claws dusky. *Juvenile* (No. 696—apparently younger than No. 799): Iris dark grey; legs patchy brown and yellow in front, yellow behind; rest as above.

[Measurements:

	Bill.	Wing.	Tail.
3 ♂♂	22.5-25	92-92.5	115-116.5 mm.
1 ♀	—	91	103.5 mm.

In juvenile plumage (Nos. 696 and 799) the wings and tail (full-grown) are considerably shorter: ♂ wing 83.5; tail 99; ♀ wing 85.5 mm.

The juvenile plumage is exactly similar to that of the adult except that the upper parts are a rather deeper richer brown.

Further specimens examined:

Bom. Nat. Hist. Soc. Coll.: ♀ 27-8-93 Thekadi, Travancore (J. P. Cook).

Brit. Mus. Coll.: 1 from Tirūmalāi, Trivandrum (A. N. Nair).—H. W.]

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A fairly common species, flocks usually of 6-8 birds frequenting well-wooded areas and keeping mostly to dense scrub and secondary growth, preferably where intermixed with tall grass and on the edge of forest clearings. I did not meet it above 3,500 ft. It was usually shy and a great skulker, and beyond occasional fleeting glimpses, much oftener heard than seen. It has a series of squeaking notes, not unpleasant, something between those of *Argya caudata* and *Turdoides striatus*. Its food consisted very largely of Lantana berries, while in tea planting localities the flowers of the *Erythrina lithosperma* shade-trees invariably attracted flocks to the nectar, the birds obviously assisting in their cross-pollination. When venturing into the open branches of these trees, they were extremely wary, and dived headlong into the undergrowth on the slightest suspicion.

As pointed out in the Eastern Ghats Report (*J.B.N.H.S.*, xxxv, 740) the distribution given in the *New Fauna* (vol. i, p. 202) is wrong. No mention is there made of its occurrence in Travancore-Cochin, while from Bett's account (*J.B.N.H.S.*, xxxiii, 543) where he confusedly records this species as *Argya caudata*, it would seem to be common in Coorg also.

Kinloch's failure to record it in the Nelliampathies was doubtless due to oversight. At Pādagiri—not far from the Palagapāndy Estate where he worked and from the Lily Downs referred to in his notes—I came across flocks on several occasions.

Breeding: The facts that two juveniles were obtained at the end of July and the beginning of August, that No. 869 (adult) was in complete moult in the middle of November, and the other two specimens were freshly moulted in January and February all suggest that the normal breeding season is later than is usually stated viz. February to May. It is, however, probably far from well-defined.

According to Bourdillon the usual nesting season in Travancore is March and April, but he also took a clutch of eggs on 23 February (*Nidification*, i, 164).

Pomatorhinus horsfieldii travancoriensis Harington. The Southern Scimitar Babbler.

Specimens collected: 5 ♂ 4-1-33, 10 ♀ 5-1-33 Marāiyūr 3,500 ft.; 144 ♂ 24-1-33 Santhanpāra at 4,500 ft.; 322 ♂ 21-2-33 Peermade 3,200 ft.; 392 ♂ 3-3-33 Kūmili 3,000 ft.; 673 ♀ 27-4-33 Balamore Estate 2,000 ft.; 885 ♀ 20-11-33 Kūriārkūtti at 2,500-3,000 ft.

Elsewhere noted at: Thattākād (200 ft.), Camp Derāmalāi (3,000 ft.), Rājampāra (1,350 ft.), Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris reddish-brown to brownish-crimson; bill yellow except basal half of culmen including nostrils, which horny-brown; mouth pinkish flesh-colour (in No. 392 yellow and brownish-pink!); legs and feet slaty or greyish-brown; claws horny-brown.

[Measurements:

	Bill.	Wing.	Tail.
6 ♂♂	28-31	93-98	97-106.5 mm.
7 ♀♀	28-31.5	89-98.5	93.5-100 mm.

Additional specimens examined:

Brit. Mus. and Bom. Nat. Hist. Soc. Colls.: ♂ 23-3-94, o? 10-4-94 Kodāikānal (J. P. Cook); ♂ 1-7-93 Pālnis (J. P. Cook); ♀ 14-5-17 High Wavy Mountains, Madūra District (S. H. Prater); ♀ 15-12-79, ♀ 20-4-80 Mynall 1,000 ft., Travancore (Bourdillon); ♀ 21-4-83 Pittūr, Pālnis (Terry); o? -3-75 Eridge, South Travancore (Hume Collection).

A very good race. Represented in Ceylon by the bright ferruginous race *melanurus* which is, however, clearly connected with *horsfieldii* by olive-brown intermediates. These ferruginous birds have the sides of the neck and fringe to the plastron identical in colour with those parts in *Pomatorhinus schisticeps*, and I think it is quite probable that *schisticeps* and its races might all be well considered races of *horsfieldii*.—H. W.]

The Scimitar Babbler is common in all evergreen and bamboo forest tracts throughout the area, whether up to 5,000 ft. in the hills (perhaps also higher) or in the low country as at Thattākād. Pairs or flocks of up to about ten birds

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(according to season) were met with either feeding on the ground in the undergrowth of *Strobilanthes*, wild *Zingiber* or Cardamom plants or up among the moss-covered branches of forest trees, and frequently as members of the localised bird associations or mixed hunting parties. They were also partial to thorny scrub, like *Acacia intsia* or *Lantana*, on the edge of hill-paddy 'toungya'), tea or cardamom clearings.

The members of the pairs or flocks keep in touch with one another by mellow bubbling or gurgling calls. When disturbed, the birds hop along the branches with great agility as if to get under weigh before taking off into the air.

In the Pālni Hills, Fairbank did not consider it abundant at Kodāikānal in June, judging from the calls (*S.F.*, v, 404).

This species is replaced in Ceylon by *P. melanurus* (vide H. W.'s note, *supra*).

Breeding: In specimen No. 885 (20 November) the ovarian follicles were considerably enlarged (damaged by shot!). There were no signs of moult, and a distinct incubation patch was present. The birds at this time were mostly seen in pairs.

In No. 5 (4 January) the testes measured 5×4 mm. It had a strip of something like the outer fibrous skin of a banana stem in its bill and was accompanied by its mate which was also carrying similar building material. This suggests that both sexes partake in nest building. They were working in a patch of thick impenetrable scrub consisting of *Lantana*, *Acacia intsia* and other thorny bushes. No. 10 (5 January) had a soft egg in the ovary, was one of a pair and breeding. On 15 January another bird was observed carrying fibrous strips of plantain bark into some dense scrub on a hillside. Nos. 322 (21 February) and 392 (3 March) also had somewhat enlarged testes, while 673 (27 April) had obviously finished breeding and was undergoing complete post-nuptial moult.

Bourdillon took many nests in Travancore and describes them as usually domed affairs made of leaves and grass, lined with roots. They are said to breed principally from December to February, but Stewart took one nest as late as 2 May. Both Stewart and Bourdillon say that c/2 or c/3 is the normal in this part (*Nidification*, i, 173-4).

From the evidence afforded by the Survey specimens, I am inclined to consider that in the Travancore-Cochin area, breeding commences rather earlier than has been recorded, i.e. by about the second half of November.

In the Pālnis, Terry (*S.F.*, x, 474) found a nest with 3 very hard-set and one 'fresh' (probably addled!) egg on 30 March, and another with 3 incubated eggs on 4 April. He identified the female shot off the latter as *melanurus*, doubtless misled by the rich colour of this race.

(On p. 211, vol. i, of the *Fauna*, it is stated about *P. h. horsfieldii*: 'This is a subspecies of the low country, it being represented by other races in the higher hills'. What is exactly meant by 'low country' is not clear; Mahābleshwar and Khandālla are included in its 'Distribution', the former being 4,500 ft. and the latter about 2,000 ft.!).

Dumetia hyperythra albogularis (Blyth). The White-throated Babbler.

Specimens collected: 17 ♂ 5-1-33 Marāiyūr 3,500 ft.; 140 ♂ 24-1-33, 170 28-1-33 Santhanpāra 3,500 ft.; 345 o? 24-2-33, 359 ♀ 25-2-33 Peermade 3,200-3,500 ft.; 485 ♀ 21-3-33 Rājampāra 1,350 ft.; 652 ♂ 24-4-33 Balamore Estate 2,000 ft.

Elsewhere noted at: Kūmili and Periyār Lake Environs (3,000 ft.); Wadakkāncheri (400 ft.).

Colours of bare parts: Iris creamy-white; bill pale horny-brown, paler on lower mandible; mouth pale yellowish-flesh to pink varying apparently with age; legs and feet yellowish-flesh colour, duskier on anterior tarsus; claws brown.

[The sexed Survey specimens measure:

	Bill.	Wing.	Tail.
3 ♂♂	14.5-15.5	57.5-65	62-66 mm.
2 ♀♀	14	53.5	55.5-60.5 mm.

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Further specimens examined:

Brit. Mus. Coll.: o? 16-3-75 Mate-ard (?), S. Travancore (Bourdillon); juv. -6-74 Lower Pālnis (Fairbank).

The juvenile specimen from the Lower Pālnis differs from the adult in having the whole upper plumage a brighter, more rufous brown with no chestnut on the forehead or crown. The lower plumage is a duller more fulvous brown with merely traces of white on the chin and throat and central abdomen, thereby affording a further proof—if more were needed than the respective distributions (as given in *J.B.N.H.S.*, xxxv, 743-745) and the existence of intermediates where they meet—that this bird is only a race of *D. hyperythra*.

Travancore specimens are not separable from those of the rest of Southern India. I have seen none from Ceylon.—H. W.]

This little babbler is generally distributed in the hilly portions of our area though it is by no means uniformly abundant everywhere. Ferguson is correct on the whole when he says that it is met with between 1,000 and 3,000 ft. elevation. I did not come across it in the low country at all, but a small flock was once noted on a dense scrub-covered side of a hummock in Cochin at about 400 ft. This, however, is the only record I have of its being found below 1,000 ft.

The birds frequent tall grass (*Andropogon*) and scrub country on hillsides, preferably in light deciduous forest, in flocks of seven or eight individuals. They are generally seen on the edge of paths or clearings in such facies, restlessly hopping about and diving among the grass stems and undergrowth in search of food, and uttering a low *swee-swee* of the volume of a Sunbird's calls varied by harsh tittering notes when agitated.

In Ceylon it is said to be tolerably common and generally distributed in all parts up to 5,500 ft.

Breeding: The only evidence is provided by No. 652 (24 April) whose testes measured 4×3 mm. and which looked as if it was preparing to breed. Most of the specimens procured in January and February were undergoing complete pre-nuptial moult.

Hume (*S.F.*, v, 404) records a nestling (presumably the one in the British Museum collected by Fairbank) from the Lower Pālnis in June. The season according to the Eastern Ghats Report (*J.B.N.H.S.*, xxxv, 745) is not well defined and varies from the middle of April to the middle of November, irrespective of locality. According to the *Fauna* the principal breeding months in South India are June and July.

Pellorneum ruficeps granti Harington. The Travancore Spotted Babbler.

Specimens collected: 18 ♂ (imm.) 6-1-33, 26 o?, 27 ♂ 7-1-33, 99 ♂ (imm.) 15-1-33 Marāiyūr 3,500 ft.; 336 ♂ 23-2-33 Peermade 3,200 ft.; 503 ♂ 28-3-33 Tenmalāi 500 ft.; 878 ♂ 17-11-33 Kūriārkūtti 1,600 ft.

Elsewhere noted at: Santhanpāra (3,500 ft.), Thattākād (200 ft.), Kūmili, Vandamettu or Wandamet, Periyār Lake Environs (ca. 3,000 ft.), Camp Derāmalāi (3,000 ft.), Rājampāra (1,350 ft.), Balamore Estate (2,000 ft.), Chālakūdi, Wadakkāncheri (400 ft.), Nemmāra (300 ft.), Pādagiri (3,000 ft).

Colours of bare parts: Iris hazel-brown (immature) to reddish-brown; bill upper mandible horny-brown, lower mandible usually somewhat paler; mouth in breeding ♂♂ (Nos. 336, 503, 878) brownish-pink, in immature yellowish flesh colour; legs and feet brownish flesh colour; claws duskier.

[The Survey specimens measure:

	Bill.	Wing.	Tail.
4 adult ♂♂	19-20	73.5-76	66-73 mm.
2 imm. ♂♂	19	67-72	65-69 mm.

Further specimens examined:

Brit. Mus. Coll.: The type ♂ 10-3-77 Mynall; o? 8-1-01 Vandenmettu, Cardamom Hills (Ferguson).

A very good race, most markedly distinct from the typical form. The crown and nape are dark chestnut, the upper parts are dark olive brown, whilst the spotting on the lower surface is not only heavier but, with the dark wash on the flanks, is much darker brown than in the typical race.—H. W.]

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The Spotted Babbler is generally distributed in all well-wooded areas throughout the two States. I came across it from 200 ft. above sea-level at Thattākād up to at least 6,000 ft. elevation in evergreen sholas on the hills surrounding Marāiyūr.

Pairs or family parties were usually met with in dense thickets and evergreen undergrowth by ravines and hill nullahs, the birds rummaging on the damp ground amongst the mulch and humus flicking the leaves here and there in their search for lurking insects. They were also partial to dense growths of Eeta bamboo (*Ochlandra travancorica*) especially on steep hillsides and along hill nullahs. In facies where a mixture of the evergreen and deciduous types of forest preponderated, their favourite haunts were the dry ravines and watercourses littered with rotting bamboos and brushwood and overgrown with thickets of *Acacia intsia*, *Zizyphus rugosa* and 'channa' or wild Zingiber etc.

On the whole it is an extremely shy bird, retiring into dense cover on the slightest suspicion, and is much oftener heard than seen. At Marāiyūr, however, I found it not only common but also surprisingly bold. It frequented the scrub and hedges about the petty Government offices and camp shed, and did not object to observation at close quarters.

Its percussive song of several rich and loud whistling notes was invariably heard in the early mornings and late afternoons wherever the birds were present. The notes more commonly uttered, however, are the ones I have elsewhere rendered as a somewhat plaintive *He'll beat you* or simply *He'll beat* which at times have a curiously ventriloquistic quality. Sometimes these are repeated from the branch of a tree in dense forest for well over five minutes at a stretch and without any variation. When the tree is approached, the bird ceases to call, noiselessly and imperceptibly drops down into the undergrowth below and disappears, and while you are still straining to catch a glimpse of it in the branches it calmly begins calling again 50 yards away! When alarmed, it gives vent to a series of sharp chuckling chirps or chirrups as it hurriedly moves away through the undergrowth.

In my opinion the statement based on Bourdillon's and Ferguson's accounts that the Spotted Babbler is rare in Travancore is untenable. In Cochin also I found it far from scarce in suitable localities and can confirm Kinloch's statement that it is common in the Nelliampathies.

Fairbank (*S.F.*, v, 404) frequently heard it in the Pālnis (sub-species?) but was never able to see one and procure a specimen.

In Ceylon the species does not occur.

Breeding: No. 878 (17 November) had the testes enlarged to 4×2 mm. (slightly pigmented) and from the freshness of its plumage it appeared to be getting ready to breed. No. 18 (6 January) was a juvenile with soft skull, completing its post-juvenal moult. No. 99 (15 January), also a juvenile with soft skull was in heavy post-juvenal body moult. Both these birds were members of family parties consisting of parents and two or three young. No. 336 (23 February) had testes measuring 7×4 mm. It was in freshly moulted plumage, one of a pair and evidently breeding. No. 503 (28 March)—testes 5×4 mm.—though moulting remiges was otherwise in fresh plumage and either breeding or about to.

The breeding season appears to commence about November and to continue till April or thereabouts. As is the case with most birds in the Travancore-Cochin area, it evidently begins considerably earlier than in other parts where, in the case of the typical race, March, April and May are given as the breeding months. Two clutches given by Stewart to Mr. Baker, c/4 and c/3 respectively, were taken on 7 June and 10 May (*Nidification*, i, 204).

Alcippe poioicephala poioicephala (Jerdon). The Nilgiri Quaker Babbler.

Specimens collected: 132 ♀ 23-1-33, 156 ♂ 25-1-33, 176 ♀, 177 ♂ 28-1-33, 192 ♀ (imm.) 30-1-33 Santhanpāra 3,500 ft.; 213 ♂ 4-2-33 Thattākād 200 ft.; 321 ♂ 21-2-33 Peermade 3,200 ft.; 364 ♀ 27-2-33 Kūmili 3,000 ft.; 876 ♂ 17-11-33, 890 ♂ 21-11-33 Kūriārkūtti 1,600 ft.

Elsewhere noted at: Marāiyūr (Common between 6,000-7,000 ft.), Camp Derāmalāi (3,000-4,500 ft.), Rājampāra (1,350 ft.), Tenmalāi (500 ft.), Balamore Estate (2,000-4,000 ft.), Kuvallé Incline (Cochin Forest Tramway), Kūriārkūtti (up to 4,000 ft.), Pādagiri (3,000 ft.).

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Colours of bare parts: *Adult*: Iris greyish-brown; bill dark horny-brown, commissure and lower mandible greyish; mouth pale flesh colour; legs, feet and claws greyish-brown. *Immature* (No. 192): Iris slaty-grey; gape and mouth bright yellow; chin duller yellow; paler portions of bill yellowish; legs, feet and claws as in adult.

[Further material examined:

Brit. Mus. Coll.: ♂ 4-4-79 Eridge; ♀ 12-12-78 Mynall; ♀ -9-74, o? -3-75 Eridge (Bourdillon); o? 9-1-01 Bandanutta [Vandamettu ?] (A. N. Nair).

Bom. Nat. Hist. Soc. Coll.: ♂ 1-7-93 Pulneys (J. P. Cook).

Measurements (including above):

	Bill.	Wing.	Tail.
8 ♂♂	15-16	68-73	60-67 mm.
6 ♀♀	15.5-16	65-70.5	61.5-64.5 mm.

A. p. brucei differs from this, the typical race, in being altogether paler. The crown and nape are a clearer colder grey; the rest of the upper parts are greyer and colder with less brown in them; the wings and tail are not so dark. The lower parts are also much paler, washed with greyer brown, as compared with rich fulvous. It is slightly larger; an equal number of birds measure:

	Bill.	Wing.	Tail.
8 ♂♂	15-17	69.5-77	64.5-70.5 mm.
6 ♀♀	15-16.5	67.5-73	61.5-69.5 mm.—H. W.]

It would perhaps be accurate to designate this Quaker Babbler as the commonest and most abundant bird species inhabiting the evergreen forest tracts of the States. I met with it from almost the level of the low country (Thattākād 200 ft. !) up to an elevation of 7,000 ft. in ravine sholas on Kūmarikkaimalāi near Marāiyūr.

The birds move about in parties of 7 to 10 individuals hunting insects among the foliage of the moss-covered trees, hopping about from sprig to sprig and often clinging upside down to peer into the angles of the leaf-stalks. They also descend lower down into the evergreen undergrowth of seedlings and cane-brakes, and almost invariably form the nucleus of the mixed hunting parties of small birds in the forest. At Kūriārkūtti they were common in the mixed bamboo forest as well as in the frequently intervening patches of evergreen.

The 'song' of four quavering whistling notes of the consistency of a Magpie Robin's, is repeated incessantly as the birds move about.

Like many other birds, I found them very partial to the nectar of *Erythrina lithosperma* flowers, and wherever these trees occurred shading coffee or tea on the edges of evergreen patches, parties were invariably observed probing into the blossoms. They must be added to the long list of bird species on which this tree is dependent for the cross-pollination of its flowers. A specimen shot in the act of eating nectar had pollen adhering to its chin and throat.

Kinloch appears to have overlooked this species in his list for the Nelliampāthies where I found it common.

In the Pālni Hills also it is common. Fairbank (*S.F.*, v, 404) observed it in wooded ravines on the hillsides.

The species is not found in Ceylon.

Breeding: No. 876 (17 November) appeared to be getting ready to breed. Its testes showed a slight development, while it was undergoing a complete (pre-nuptial ?) moult.

No. 132 (23 January) had a soft ovarian egg and some of the other follicles upto 4 mm. in diameter. It was in freshly moulted plumage.

No. 156 (25 January) testes 10×6 mm. Fresh plumage.

No. 176 (28 January) soft ovarian egg and follicles greatly enlarged. An incubation patch was present, and the bird was carrying a fine rootlet in its bill. No moult.

No. 177 (28 January) testes 9×6 mm. Fresh plumage.

No. 192 (30 January) juvenile with very soft skull. Out of nest, but being tended by parent.

No. 213 (4 February) testes 8×6 mm. Fresh plumage.

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No. 321 (21 February) testes 9×7 mm. Moulting body and remiges. (Post-nuptial ?).

On 25 April (Balamore, Ashāmbu Hills) a nest was discovered in a dense evergreen shola at ca. 3,000 ft. It was a flimsy cup of hair-like rootlets and some moss, slung hammock-wise between two horizontal twigs of a seedling at a height of about 4 ft. Diameter of cup ca. 70 mm.; depth 80 mm. It contained two naked chicks, one of which was observed at 7 a.m. pushing itself out of the shell. By 3-15 p.m. a fine fluffy down of pale yellow colour had made its appearance at various points on the back. The ground below the nest swarmed with leeches.

As is clear from the above, in Travancore-Cochin the breeding season lasts from January to May at least. That it may begin a month or so earlier is suggested by one of the Survey specimens, while it is said to continue till June. According to *Nidification*, i, 245, it breeds in Travancore principally in May and June, often April, while Stewart says he has taken eggs in every month of the year. Full clutch 2, rarely 3 eggs, but A. P. Kinloch took several c/3 at Kollengode and considered this the normal there.

At Culputty, South Wynaad, Mr. Darling, Junior, found a nest as late as October.

Rhopocichla atriceps bourdilloni (Hume). Bourdillon's Babbler.

Specimens collected: ♀? 10-1-33 Marāiyūr (at 6,000 ft.); 159 ♂, 160 ♂ 25-1-33; 169 ♂ (imm.) 28-1-33, 197 ♂ (imm.) 31-1-33 Santhanpāra 3,500 ft.; 223 ♀? (imm.) 6-2-33 Thattākād 200 ft.; 323 ♂ 21-2-33 Peermade 3,200 ft.; 363 ♂ 27-2-33 Kūmili 3,000 ft.; 426 ♀ 9-3-33 Camp Derāmalāi 3,000 ft.; 477 ♀ 20-3-33 Rājampāra 1,350 ft.; 494 ♂, 495 ♀ 26-3-33 Tenmalāi 5,000 ft.; 645 ♂ 23-4-33 Balamore Estate 2,000 ft.; 822 ♀? 10-8-33 Kūtyāni 300 ft. Trivandrum Talūk; 873 ♀ 16-11-33 Kūriārkūtti 1,600 ft.; 994 ♀ 19-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Mūndakāyam (in Ūrūmbikera Reserve Forest), Wandamet, Kūvallé Incline (along Cochin Forest Tramway).

Colours of bare parts: Iris lemon yellow or pale golden yellow; upper mandible dark horny-brown; commissure and lower mandible pale greyish flesh colour; mouth *adult* pale pinkish-flesh, *immature* mouth and gape yellow; legs and feet pinkish-grey; claws dusky.

[The sexed Survey specimens measure:

	Bill.	Wing.	Tail.
8 ♂♂	15-16	55-60.5	46.5-51 mm.
5 ♀♀	14-15	54-58	43-48 mm.

In the Eastern Ghats Survey I expressed certain doubts as to whether two races *atriceps* and *bourdilloni* should be recognised, for the following reasons: (1) that *bourdilloni* exhibited characters which might suggest that it was the juvenile plumage of *atriceps;* (2) that both forms were stated to occur throughout the Travancore hills; and (3) that Trichoor, the usually accepted type-locality of *atriceps* was in the area which geographically should be occupied by *bourdilloni*.

The question has now been cleared up by the fine series collected by Mr. Sálim Ali. This shows that the juvenile and adult birds of this race are alike in colouration, both being brown-headed. It also shows that there is a certain amount of variation in the colour of the crowns, some being browner and others blacker. This is to be expected, as *bourdilloni* is an intermediate form between *atriceps* and *nigrifrons*, and it no doubt explains Ferguson's statement that both forms occur throughout the Travancore Hills, though *atriceps* is far less common (*J.B.N.H.S.*, xv, 260). No true *atriceps* was met by the Surveys.

As regards the type-locality of Trichoor for *atriceps*, the two Survey specimens from Cochin State are beyond all doubt *bourdilloni* and it therefore appears very highly probable that birds from Trichoor must belong to the same form and not to *atriceps*. None are, however, available for examination. It must be remembered moreover, that Jerdon only recognised one form. His original description most clearly refers to typical *atriceps* with the black head, but his localities no doubt refer to both forms for he says: 'I have seen it in the Trichoor and Wurguncherry [Wadakkancheri ?] jungles and also on the Coonoor Ghat and in the Wynaad' and in the *Birds of India* (vol. ii, p. 19)

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whilst still only recognising one form he expands his localities to include 'all the forests of Malabar', that is the Malabar Coast.

Trichoor was only selected later as type-locality as it was the first locality mentioned, but since it appears certain that this locality is within the range of the southern form, the type-locality must be shifted to one of the other places mentioned by Jerdon. I accordingly designate the Wynaad as the type-locality.

I may mention that this is one of the species in which 'museum browning' is very marked—fresh birds being much more olive in tint than birds kept for some years.—H. W.]

Bourdillon's Black-headed Babbler is essentially a bird of evergreen forest and is met with wherever patches of this occur, from the level of the low country up to an elevation of at least 6,000 ft. in the hills. It goes about in flocks of from 5 to 10 birds, keeping to dense undergrowth of rattan (*Calamus*) and seedlings or *Strobilanthes* especially by the edge of paths or clearings, and seldom ascends higher up into the trees. So narrowly is it confined to evergreen jungle that I frequently came across it in sholas bordering the ravines amongst the grassy hilltops at Wandamet (Cardamom Hills) often barely half an acre in extent and separated from the next, no bigger than itself, by a mile or more of open rolling grass-covered 'downs'. At Kūtyāni in the environs of Trivandrum town where tiny patches of evergreen occur between hummocks covered with tapioca and plantain cultivation (with paddy-fields in the intervening narrow flats or valleys) and sundered by miles from the nearest evergreen patch of any size, this species has persisted in virtual isolation since at least 1903 when Ferguson recorded meeting it in these 'serpent groves', most of which have by now disappeared.

At Kūriārkūtti, the birds were commonly observed in mixed bamboo forest on the verge of evergreen jungle, amongst dense scrub and thickets.

A harsh, rather subdued *chur-r, chur-r,* etc., something like similar notes of the Iora, is uttered as the flocks move about the undergrowth very much in *Dumetia* fashion, and the birds have a habit—having ventured too far up in a cane-brake or the like—of dropping perpendicularly like a falling leaf into the thickets below on the slightest alarm or suspicion.

Fairbank does not seem to have come across it in the Pālnis though it is more than likely that it occurs in those hills.

The Ceylonese race *R. a. nigrifrons* is found throughout that island.

Breeding: Nos. 169 (28 January), 197 (31 January) and 223 (6 February) were all immature birds with very imperfectly ossified skulls, juvenile gape and mouth and Nos. 169 and 223 were undergoing heavy post-juvenal body moult. They were evidently between 1½ and 2½ months old. No. 477 (20 March) had conspicuously granular ovaries; it was in fresh plumage and appeared ready to breed. The gonads of the other specimens gave no indication as regards the breeding season, but it seems from the evidence that this is by no means so well defined as has been described ('March to May, July and August', *Fauna*, vol. i, p. 282) and the statement in the Eastern Ghats Report (*J.B.N.H.S.*, xxxv, 749) that breeding continues throughout the year is probably more correct.

T. F. Bourdillon (*S.F.*, ix, 299-300) took a nest at Mynall (4,300 ft.) in South Travancore on 24 March in a low bush at about 18 in. from the ground. He describes it as a domed structure, very similar to the nest of *Ochromela nigrorufa* but slightly larger, composed externally of 'Irul' [meaning doubtless Eeta (*Ochlandra*)] leaves and lined with fine hair-like roots. The eggs [number ?] were white, very sparingly spotted with purple except towards the larger end where the spots coalesced to form an imperfect zone.

According to *Nidification* (i, 254) most eggs in Travancore are laid in April, May and June, though Stewart has taken them in every month. c/2 is said to be normal, c/3 unusual.

Ægithina tiphia multicolor (Gmelin). The Ceylon Iora.

Specimens collected: 78 ♂ 13-1-33 Marāiyūr 3,500 ft.; 168 ♂ 26-1-33 Santhanpāra 3,500 ft.; 219 ♀ 4-2-33 Thattākād 200 ft.; 467 ♀ 18-3-33 Rājampāra 1,350 ft.; 490 ♂ 25-3-33 Tenmalāi 500 ft.; 636 ♀, 637 ♂ 21-4-33 Arāmboli 250 ft.; 692 ♂ 20-7-33, 721 ♀ 25-7-33 (Thirumalāi 100 ft.); 748 ♂, 749 ♀

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30-7-33 (Veli 130 ft.); 791 ♂ 5-8-33 (Poojappūra 140 ft.); 811 ♀ 8-8-33 (Mūkūnnimalāi 800 ft.) Trivandrum Environs; 964 ♀ 10-12-33 Nemmāra 300 ft.; 1034 ♂ 28-12-33 Karūpadanna ca. S.L.

Elsewhere noted at: Kottāyam (50 ft.), Peermade (3,200 ft.), Kūmili (3,000 ft.), Camp Derāmalāi (3,000 ft.—Panthalam Hills), Trivandrum Town, Cape Comorin (S.L.), Balamore Estate (2,000 ft.—Ashāmbū Hills), Kūriārkūtti (1,600 ft.), Wadakkāncheri (400 ft.), Pādagiri (3,000 ft.—Nelliampathy Hills), Trichūr, Ernakulam.

Colours of bare parts: Iris greyish- or silvery-brown; bill bluish-plumbeous, black on culmen; palate greyish-blue, gullet slaty-brown, brownish-black or slaty-pink in adult; legs and feet slaty-grey; claws brown.

[The Survey specimens measure:

	Bill.	Wing.	Tail.
9 ♂♂	17-19	63-68.5	45-51 mm.
7 ♀♀	16.5-19	61-66	47.5-52.5 mm.

Owing to the courtesy of the Director of the Colombo Museum, I have been able to examine a further series of 8 specimens of the Iora from Ceylon and these, taken in conjunction with the series in the British Museum, lead me to the conclusion that the darker and duller green of the upper parts of the female and the male in 'winter plumage' is the only satisfactory feature on which this race can be maintained. The only specimens from Travancore in the British Museum are the unsatisfactory 'Anjango' series of which only one shows the green back. I have carefully compared the good series obtained by the Surveys with these Ceylon specimens and also with an ample series of *Æ. tiphia humei* and find that the Travancore series are as a whole intermediate between the others. This being so—and it is interesting to note that No. 964 from Nemmāra in the Pālghāt Gap is quite indistinguishable from *Æ. t. humei*—I think it is of value to mark the connection between the Travancore area and Ceylon by including these intermediates under the name of the Ceylon race. There is of course no difference between the birds of Northern and Southern Travancore and these Travancore intermediates merely represent a phase of the general intergradation from north to south which I emphasised in my account of this species in the Eastern Ghats Survey (*J.B.N.H.S.*, xxxv, 750).

The series suggests that the breeding season of the Iora in Travancore is quite undefined; at any rate, accepting the usual definition that the black head and back of the male represent the breeding season and the green upper parts the non-breeding season. I find that No. 78 (13 January) is in winter plumage and Nos. 168 (26 January) and 1034 (28 December) are in breeding plumage, whilst No. 931 (1 December) is moulting into breeding plumage. Legge evidently found the same state of affairs in Ceylon and was thereby led to suggest that the black upper parts might be merely connected with age. I do not think the latter explanation necessary, however, in view of the connection between the breeding seasons and the plumage in other areas where the breeding season is more clearly defined.—H. W.]

The Iora is a common bird throughout the area from about sea-level to at least 3,500 ft. in the hills, and possibly even higher up to some extent, though at Mūnnār (5,000 ft.—Kannan Dēvan Hills) it was noted as absent. At Kotāgiri in the Nilgiris, I observed it at 5,500 ft. Ferguson does not seem to have met with it except in the low country where it is certainly more abundant. This is probably the basis for the statement in the Eastern Ghats Report (*J.B.N.H.S.*, xxxv, 749) that 'In the south-west it seems to be more definitely a bird of the plains as it avoids the Pālni Hills and the Travancore ranges south of the Pālghat Gap'.

It is a bird of light secondary or deciduous-and-bamboo jungle and avoids evergreen forest. Its favourite haunts, however, are the mango, jack and cashew gardens about villages and homesteads in the low country, and it is also quite at home in the gardens and compounds of the larger towns such as Trivandrum, Trichūr and others.

Fairbank (*S.F.*, v, 406) only obtained a specimen at the base of the Pālni Hills and does not record it higher up. The species and race are abundant in Ceylon.

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Breeding: No. 931 (1 December) was completing body moult into breeding plumage though its gonads as yet showed no development. No. 1034 (28 December) had acquired fresh breeding plumage, its testes measured 6×4 mm. (grey pigmented) and it was evidently ready to breed.

In No. 78 (13 January) the testes—ca. 2×1.5 mm.—were apparently reverting to normal non-breeding condition as the specimen was in freshly moulted non-breeding plumage. No. 168 (26 January) on the other hand was evidently ready to breed. It was completing pre-nuptial moult and had testes measuring 8×5 mm. At this time other males in breeding dress were also calling from bare branches etc. in loud melodious whistles, and displaying. No. 219 (4 February) had a firm granulated ovary and on 9 February a male in *non-breeding* plumage was observed fluffing out the white rump feathers, slightly cocking up tail, drooping wings at sides and displaying before a female in rivalry with another cock in breeding dress. If the above evidence be admissible, and I have frequently observed this on other occasions also—then Hume's statement (*S.F.*, v, 430) that cocks sometimes breed in female plumage *may*, after all, be correct. On 4 March the birds were noted as busy courting and displaying and No. 490 (25 March) had testes enlarged to 6×4 mm.

Ferguson took nests in the Public Gardens at Trivandrum in April, and one of the specimens obtained by Pillai in that neighbourhood on 8 August (No. 811) was immature with an imperfectly ossified skull and undergoing post-juvenal body moult, therefore about 2-2½ months old.

From the evidence cited above it is clear that the breeding season of the Iora in the Travancore-Cochin area is irregular and much prolonged, extending from about January to June for certain, and sporadically over the greater part of the year.

Chloropsis aurifrons insularis Kinnear and Whistler. The Gold-fronted Chloropsis.

Specimens collected: 65 ♀, 66 ♂ 11-1-33 Marāiyūr 3,500 ft.; 189 ♂, 190 ♂ (juv.) 30-1-33 Santhanpāra 3,500 ft.; 444 ♀ 16-3-33 Rājampāra 1,350 ft.; 499 ♀ (imm.) 27-3-33 Tenmalāi 500 ft.; 899 ♂ 25-11-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Thattākād (200 ft.), Kūmili (3,000 ft.), Nemmāra (300 ft.), Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: *Adult*: Iris hazel brown; bill in ♂ black, ♀ horny-brown; mouth pinkish-flesh to slaty-pink; legs and feet grey or plumbeous; claws brown. *Juvenile*: Bill pale horny-brown; mouth vivid pink; rest as in adult.

[Measurements of 12, including Survey series:

	Bill.	Wing.	Tail.
7 ♂♂	22.5-25	86.5-93.5	65-69 mm.
5 ♀♀	22-23	84.5-90.5	64.5-67 mm.

For plumages see Eastern Ghats Report, *J.B.N.H.S.*, xxxv, 752.

In the Eastern Ghats Survey the name *Chloropsis aurifrons davidsoni* Stuart Baker was used for the race of this species found in Southern India exclusive of the range of *C. a. insularis*. This was a name proposed by Mr. Stuart Baker, *Bull. B.O.C.*, xli (1920), p. 8, in place of *Chloropsis malabaricus* (Gmel.) pre-occupied. Dr. Sassi has, however, since shown [*Bull. B.O.C.*, liii (1932), p. 44] that this race should be known as *Chloropsis aurifrons frontalis* (Pelzeln) as it was so described by Pelzeln in Sitzungsberichte der Mathem.-naturwiss. Klasse der Kaiserl. Academie der Wissenschaften in Wien, Tome, xx (1856), p. 157, pl. ii, fig. i. The type is an adult male in the Vienna Museum collected at Khelgate near Goa by Baron Huegel. *C. a. davidsoni* Stuart Baker will therefore stand as a synonym.—H. W.]

This Chloropsis is fairly common throughout the States inspite of Ferguson's statement that it is not found in the low country. I came across it from about 200 ft. (Thattākād) up to an elevation of 3,500 ft. in the hills of both Travancore and Cochin. My impression is that this species prefers more thickly wooded country than Jerdon's Chloropsis. Thus, at Thattākād where patches of dense evergreen forest and open deciduous and secondary jungle occur in juxtaposition, *aurifrons* was more or less confined to the former and *jerdoni* to the latter. The birds were usually met with in pairs, but family parties of 3 or 4 were not uncommon.

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In addition to insects, spiders and berries, its food consists to a large extent of the nectar of flowers. I frequently, and regularly, observed it probing with its bill into blossoms of the following species which it doubtless plays a considerable part in cross-pollinating:

Musa (*sapientum*?),
Mucuna pruriens (pollen on forehead!),
Erythrina lithosperma and *E. suberosa*,
Loranthus longiflorus,
Mezoneuron cucullatum (var. *grandis*).

Fairbank does not record the Gold-fronted Chloropsis in his Pālnis list (*S.F.*, v). The race *insularis* is generally distributed in Ceylon up to 4,000 ft.

Breeding: Specimen No. 899 (25 November) was completing pre-nuptial moult and its testes were enlarged to 4×3 mm. On 30 November a male (?) was observed feeding a full-fledged young in which latter the black gular patch and blue moustachial streaks were as yet absent. Nos. 65 and 66 (11 January) were a pair. The ovary of the female was distinctly granular (follicles about 1 mm. in diameter) while the testes of the male measured 5×3. The birds were in fresh plumage except for a light moult on the female's breast, and were evidently ready to breed.

No. 189 (30 January—testes ca. 4×3 mm.) was the parent of No. 190 and was busy feeding the latter on a tree in dense scrub jungle. The young was probably less than a week out of nest. Its skull was papery and rectrices, remiges and tectrices only partly grown.

Specimens shot on 16 and 27 March showed no genital development and were undergoing complete post-nuptial (?) moult, in the latter only tail and body.

The breeding season in this area is apparently from about November to February.

Chloropsis jerdoni (Blyth). Jerdon's Chloropsis.

Specimens collected: 246 ♀, 247 ♂ 8-2-33 Thattākād 200 ft.; 688 ♀ 18-7-33 (Pūlayanār Kotta 300 ft.); 740 ♂ 29-7-33 (Kūttāni 300 ft.); 783 ♀ 4-8-33 (Cattle Farm); 808 ♀ 8-8-33 (Mūkūnni Malāi 800 ft.); 815 ♂ (Nettāyam 200 ft.) Trivandrum Environs; 1017 ♂, 1018 ♀ 26-12-33 Karūpadanna ca. S.L.

Elsewhere noted at: Marāiyūr (3,500 ft.), Kottāyam (S.L.), Ūrūmbikera Reserve Forest (ca. 1,000 ft.—near Mūndakāyam), Kūmili (3,000 ft.), Arāmboli (250 ft.), Balamore Estate (2,000 ft.), Kūriārkūtti (1,600 ft.).

I noted it as absent at Rājampāra where only *aurifrons* seemed to occur.

Colours of bare parts: Iris hazel brown; bill ♂ black, ♀ horny-brown, grey at sides of base of lower mandible; mouth pinkish-grey or pinkish-slate; legs and feet slaty-grey; claws dusky.

[The Survey specimens measure:

	Bill.	Wing.	Tail.
3 ♂♂	23-24	87-90.5	69.5-72.5 mm.
6 ♀♀	22.5-23.5	83.5-86.5	66.5-69.5 mm.

Plumages given in Eastern Ghats Report, *J.B.N.H.S.*, xxxv, 753.—H. W.]

Jerdon's Chloropsis is fairly common in the drier parts of the area. It inhabits open deciduous country, secondary scrub, groves of jack, cashew, mango etc. and pepper cultivation about homesteads, and avoids densely wooded tracts. Ferguson states that it does not ascend the hills; I however, met it up to an elevation of 3,500 ft. In food and habits it does not differ to any appreciable extent from the foregoing species. In several localities in Cochin I found it a wholetime attendant on the blossoms of *Helicteres isora*, probing into them for the nectar.

In the Pālnis, Fairbank (*S.F.*, v, 406) obtained a specimen at 4,000 ft. in the lower hills. In Ceylon Jerdon's Chloropsis is fairly generally distributed up to 3,500 ft.

Breeding: Nos. 1017 and 1018 (26 December), a pair, were certainly breeding. The testes of the one measured 5×3 mm., while the ovarian follicles of the other were considerably enlarged, the largest measuring 5 mm. in diameter. In Nos. 246 and 247 (8 February), also a pair, the ovarian follicles were about 1 mm. and the testes ca. 4×3 mm. They were undergoing pre-nuptial body moult—more advanced in the male than in the female—and evidently preparing to breed.

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Two of the specimens collected by Pillai (Nos. 783 and 815) on 4 and 9 August in the environs of Trivandrum town had imperfectly ossified skulls from which it would appear that the breeding season, commencing probably about November as in the foregoing species, continues till at least June, and perhaps later.

Family: Pycnonotidae.

Microscelis psaroides ganeesa (Sykes). The Southern Indian Black Bulbul.

Specimens collected: 112 ♀ 19-1-33 Munnar 5,000 ft.; 659 ♂ (imm.) 25-4-33 Muthukuzhi 3,500 ft.; 974 ♂ 13-12-34 Padagiri 3,000 ft.

Elsewhere noted at: Maraiyur (3,500 ft.), Santhanpara (3,500 ft.), Peermade (3,200 ft.); Camp Deramalai (3,000 ft.), Balamore Estate (only above 2,500 ft.).

Colours of bare parts: *Adult*: Iris orange-brown; bill bright deep orange; mouth orange and pink; legs and feet yellowish-orange; claws horny-brown. *Immature*: Iris olive-brown; bill horny-brown, paler at tip; gape yellow; mouth yellowish-pink; legs and feet yellowish-brown; claws horny-brown.

[Measurements of 11 including Survey specimens:

	Bill.	Wing.	Tail.
7 ♂♂	26-28.5	117.5-124.5	98-105 mm.
4 ♀♀	26-28.5	112-123	96.5-104.5 mm.

Further specimens examined:

Brit. Mus. Coll.: ♂♂ 21-6-77 Kodaikanal 7,000 ft., ♀ 1-6-77 Palnis (Fairbank); ♂ 21-12-79, ♂ 24-12-79 Nangand (?), ♀ 29-11-78 Mynall (Bourdillon).

Bom. Nat. Hist. Soc. Coll.: ♂ 18-8-93 Thekadi (J. P. Cook).

H. Whistler Coll.: ♀ 26-10-23 Nelliampathies 3,500 ft. (A. P. Kinloch).—H. W.]

The lowest elevation at which the Surveys came across the Black Bulbul was about 2,500 ft. and it is a common species in all the hills from 3,500 ft. up. Ferguson records once having met a large flock as low down as 1,500 ft., while according to Bourdillon it is 'found also in small numbers at the foot of the hills'. This latter must surely be an extremely rare occurrence.

The birds go about in noisy flocks of 6 to 12, often considerably larger, and usually keep to the tall tree-tops or the higher branches of forest trees, whence they may frequently be seen launching short twisting sallies after winged insects. *Eucalyptus* trees are much favoured, and I observed both in these hills—wherever the tree has been introduced—and in the Nilgiris, that the birds regularly visited the white 'brush-like' flowers principally for the attending insects but also occasionally sipping the nectar. Some of the commonest members of the localised bird associations or hunting parties in the sholas at about 5,000 ft. were: *Microscelis, Zosterops, Sitta frontalis, Culicicapa, Pomatorhinus, Trochalopteron* (frequently), *Muscicapula pallipes, Ochromela nigrorufa*. The first usually kept to the tree-tops or higher branches, the last two to the evergreen undergrowth of seedlings etc. while the remaining hunted indiscriminately between these two 'zones'.

The nectar of *Erythrina lithosperma* is much sought after by Black Bulbuls, and the shade trees on coffee estates in the higher hills were in constant attendance by noisy flocks. I found them also feeding largely on the ripe drupes of *Zizyphus œnoplia* (at Maraiyur) and on Jamun (*Eugenia* sp.) and *Vaccinium Leschenaultii* ('Bilberries').

In the Palnis, Fairbank (*S.F.*, v, 405) found them in groves both at the tops of the hills and lower down. In June they were in noisy flocks of 20 to 30 birds. Terry (*S.F.*, x, 476) also came across them on 2 or 3 occasions at Pulungi. In the Nelliampathies where they are extremely common, Kinloch found that the flocks broke up into pairs about February. This Bulbul is represented in Ceylon by the race *humii* which has a larger bill.

Breeding: In No. 974 (13 December) the testes were undeveloped. No. 112 had a distinctly granulated ovary, the follicles measuring about 1 mm. in diameter, and the bird was in somewhat worn plumage. At this time pairs were observed in courtship. No. 659 (25 April) was immature (with very imperfectly ossified skull) undergoing post-juvenal body moult. On 17 July at Kotagiri (Nilgiris) I found them feeding full-fledged young similar to No. 659, generally.

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In Travancore Stewart found them breeding at between 4,000 and 6,000 ft. elevation in dense forest, principally in April and May. Kinloch also records the same to be the chief breeding months in the Nelliampathies (*Nidification*, i, 343).

Molpastes cafer cafer (Linn.). The Ceylon Red-vented Bulbul.

Specimens collected: 261 ♂ 10-2-33 Thattākād 200 ft.; 564 ♂ 11-4-33 Cape Comorin ca. S.L.; 691 ♂ 20-7-33 (Marūthānkūzhi 50 ft.); 752 ♀ 30-7-33 (Thirūmalāi 120 ft.) Trivandrum Environs; 951 ♂ 7-12-33 Nemmāra 300 ft.

Elsewhere noted at: Marāiyūr (3,500 ft.), Kottāyam (ca. S.L.), Rājampāra (1,350 ft.—Panthalam Hills), Trivandrum Town, Arāmboli (250 ft.), Chālakūdi, Wadakkāncheri (400 ft.), Karūpadanna (ca. S.L.).

Noted as absent at: Mūnnār (5,000 ft.), Santhanpāra (3,500 ft.), Kūriārkūtti (1,600 ft.), Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris brown; bill brownish-black; mouth pinkish yellow; legs, feet and claws blackish-brown.

[Measurements of 9 including Survey specimens:

	Bill.	Wing.	Tail.
7 ♂♂	19-21	92.5-98	76-84 mm.
2 ♀♀	18.5-21	91.5-98.5	83 mm.

Further material examined:

Brit. Mus. Coll.: ♂ 18-11-78, ♂ 19-11-78 Trivandrum (Bourdillon); ♂ 27-5-77 Vengāyam Parry, E. base of Pālnis (Fairbank); ♀ 28-2-75 Kolāchal, Travancore.—H. W.]

The distribution of the Red-vented Bulbul in the area covered by the states of Travancore and Cochin is peculiar and worthy of closer scrutiny. The precise ecological factors that control it are obscure. I met it from about sea-level to an altitude of 4,000 ft., but on the whole it would perhaps be correct to say that it avoids elevations over 1,500-2,000 ft. and also country that is densely wooded. In the Nilgiris, however, I found it common up to 5,000 ft. At Thattākād a sharp division between the biotopes of this Bulbul and the Red-whiskered species was clearly noticeable. In the mixed evergreen-and-deciduous forest patches none of the former were in evidence though the latter were abundant, while as soon as one reached dry deciduous-and-scrub country the tables were turned and *Otocompsa* almost completely disappeared. It was more or less the general rule for the two to replace each other in the localities and biotopes suited to them.

The following table expresses as nearly as possible their respective positions in Travancore and Cochin.

Locality.	*Molpastes*.	*Otocompsa*.
Marāiyūr, 3,500 ft.	Common	Common.
Mūnnār, 5,000 ft.	Absent	Common.
Santhanpāra, 3,500 ft.	Absent	Common to very common.
Thattākād, 200 ft.	Not common	Common.
Kottāyam, ca. 50 ft.	Common	Much less common.
Peermade, 3,200 ft.	Absent	Very common.
Kūmili, 3,000 ft.	Very scarce (Only 3 !)	Common.
Camp Derāmalāi, 3,000 ft.	Absent	Fairly common.
Rājampāra, 1,350 ft.	Fairly common	Fairly common.
Tenmalāi, 500 ft.	?	Fairly common.
Trivandrum Town	Common	Common.
Cape Comorin	Fairly common	Absent.
Aramboli, 250 ft.	Common	Absent.
Balamore Estate, 2,000 ft.	Absent	Common.
Chālakūdi	Fairly common	?
Kūriārkūtti, 1,600 ft.	Absent	Not common.
Wadakkāncheri, 400 ft.	Common	Not common.
Nemmāra, 300 ft.	Common	Absent.
Pādagiri (from 1,500 ft. up)	Absent	Very common.
Karūpadanna	Fairly common	Not common.

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The food of this species in common with that of the rest of the *Pycnonotidae* consists chiefly of fruits and berries. The following are some of the species observed to be patronised as and wherever available: *Zizyphus oenoplia, Maesa perrottetiana, Eugenia jambolana, Vaccinium Leschenaultii, Salvadora persica, Polygonum chinense* L., *Trema orientalis* Blume, *Berberis tinctoria* Lesch., *Lantana camara*, also figs of *Ficus bengalensis, F. religiosa* and *F. glomerata*. A great many others are also eaten and there is no doubt that this group is of the greatest importance in the dispersal of the plants. I also observed these Bulbuls regularly eating nectar from flowers of *Erythrina lithosperma, Bombax malabaricum, Loranthus longiflorus, Grevillea robusta* and other species.

In the Pālnis both Fairbank (*S.F.*, v, 405) and Terry (*S.F.*, x, 476) found the Red-vented Bulbul somewhat rare as compared with *Otocompsa* at the top of the hills, but more abundant down the slopes and in the adjacent plains.

The same race, *cafer*, occurs in Ceylon throughout the low country and at medium elevations in the hills, becoming rarer higher up.

Breeding: On November 25 (Wadakkāncheri) a bird was observed carrying nesting material in its bill. In No. 261 (10 February) the testes—ca. 3×2 mm. —appeared to be developing and the bird was completing pre-nuptial moult (?). On 19 April (Arāmboli) a nest in a *Thespesia populnea* tree at 10 ft. contained two chicks about 5 days old, with quills sprouting, and one addled egg. Both parents were busy feeding the young (on berries !).

The gonads of the two specimens obtained in July were also slightly developed, but from their plumage they appeared to have finished breeding.

Ferguson took a nest with 2 eggs on 29 March and mentions another in the Public Gardens at Trivandrum which contained 3 young birds at the end of April. According to him, the breeding season in Travancore is February to May. T. F. Bourdillon took nests with eggs in May and June (*Nidification*, i, 354).

Probably as elsewhere in its range, there is really no well-defined season and the breeding period fluctuates considerably on either side of the above extremes.

Otocompsa jocosa fuscicaudata Gould. The Southern Red-whiskered Bulbul.

Specimens collected: 341 ♂ (juv.) 23-2-33 Peermade 3,200 ft.; 650 ♀, 651 ♂ 23-4-33 Balamore Estate 2,000 ft.; 686 ♀ 18-7-33, 831 ♂ 11-8-33 (Pulayanārkotta 200 ft.); 855 ♂ 30-7-33 (Thirūmalāi 100 ft.) Trivandrum Environs; 887 ♂ 21-11-33 Kūriārkūtti 1,600 ft.

Elsewhere noted at: See table under *M. c. cafer*.

Colours of bare parts: Iris hazel-brown to brown; bill horny black; mouth orange-yellow and pink; legs, feet and claws horny brown.

[The Survey specimens measure:

	Bill.	Wing.	Tail.
4 ♂♂	18.5-20.5	83.5-89	79-84 mm.
2 ♀♀	18-18.5	81-83	77-80 mm.

No. 341 is in juvenile plumage. This is very similar to the adult but the crest is shorter and browner, a less pure black; the red 'whisker' patch is absent; the upper parts are duller, more rusty in colour and the gorget is duller; the undertail coverts are dull pinkish. The first primary is softer and more rounded, while the outer tail feather is narrower and more pointed at the tip.—H. W.]

The distributional peculiarities of this Bulbul in the Travancore-Cochin area have already been dealt with above.

In the Pālni Hills both Fairbank (*S.F.*, v, 405) and Terry (*S.F.*, x, 476) found it extremely common on the tops of the hills and extending right down to the bottom. This species is absent in Ceylon.

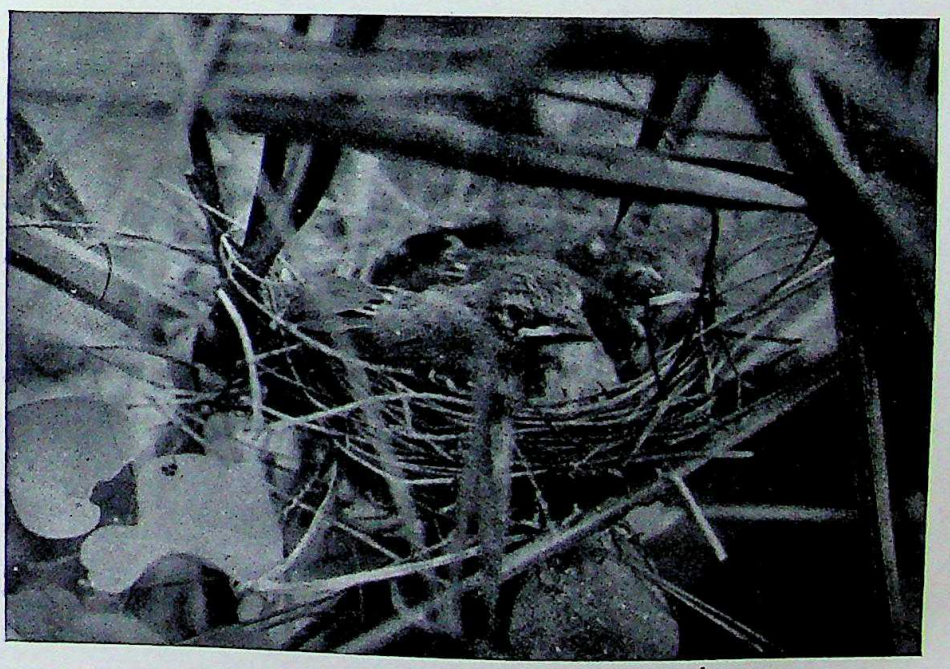
Breeding: In No. 887 (21 November) the testes measured 3×2 mm. and appeared to be developing. On 25 January (Santhanpāra) 2 nests were discovered in small bushes in an open patch of brushwood on the verge of a cardamom shola, each containing c/2. One egg from either clutch measured 23×16 mm. A third nest was situated in the thatch of a tenanted hut, containing c/2 on 30 January. During the night one of the eggs hatched. At

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Red-whiskered Bulbul (*Otocompsa emeria*) on nest in Cycad palm.



Nest of White-browed Bulbul (*Pycnonotus luteolus*) with chicks 9 days old.
Photos by Author.

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this time full-fledged young, recently out of nest, were observed on all sides being fed (on insects and various *Ficī*) and fussed over by the parents.

On 11 February a fourth nest was located on the bank of the Periyār River at Thattākād, in a branch of Eeta bamboo overhanging the water's edge. It was at a height of 5 ft. from the ground and contained c/2.

Specimen No. 341 (23 February) was juvenile with very soft skull and evidently not more than 3 weeks to a month old. On the same date an adult bird was observed carrying nesting material.

On 9 March (Camp Derāmalāi) a pair were building in a small tree at ca. 7 ft. a couple of yards from a residential bungalow. In the pair shot at Balamore Estate on 23 April (Nos. 650 and 651) the largest ovarian follicle measured 7 mm. in diameter while the testes of the male were enlarged to 5×4 mm. and the birds were obviously breeding. From the condition of their gonads both Nos. 686 (18 July) and 855 (30 July) also appear to have been either breeding or about to; the largest ovarian follicles of the former measured about 3 mm. in diameter, the testes of the latter 4×3 mm.

The above evidence suggests that while the breeding season is undoubtedly at its height in the months from December to May, it may extend considerably on either side of these extremes. In fact, it seems more than likely that, as is the case in other areas, breeding continues more or less sporadically throughout the rest of the year also.

Bourdillon gives December to June as the breeding season in Travancore, and according to him the birds lay 3 or 4 eggs. My experience during the Surveys has been invariably with 2 eggs or young.

Iole icterica (Strickland). The Yellow-browed Bulbul.

Specimens collected: 32 o? 7-1-33 Marāiyūr (at 4,500 ft.); 208 ♀ 3-2-33 Thattākād 200 ft.; 432 ♂ (juv.) 10-3-33 Camp Derāmalāi 3,000 ft.; 875 ♀? 17-11-33 Kūriārkūtti 1,600 ft.

Elsewhere noted at: Santhanpāra (3,500 ft.), Peermade (3,200 ft.), Kūmili (3,000 ft.), Rājampāra (1,350 ft.), Tenmalāi (500 ft.), Balamore Estate (2,000 ft.), Wadakkāncheri (400 ft.), Pādagiri (from 1,500 ft. up).

Colours of bare parts: *Adult*: Iris brownish-red; bill horny-black; mouth brownish-pink, slaty-pinkish and yellow, or pinkish-grey varying apparently with age (or season ?); legs and feet slaty-grey; claws horny-black. *Juvenile* (No. 432): Iris greyish-olive; bill pale horny-brown; naked chin and circumorbital skin dull magenta; gape yellowish-cream; mouth livid pink; legs pinkish-grey; feet pinkish-flesh; claws pale horny-brown.

[Series not satisfactory for measurements owing to moult. I have also examined 6 specimens from Travancore and 4 from the Pālnis in the British Museum Collection.—H. W.]

The Yellow-browed Bulbul is one of the commonest forest-frequenting species in all suitable tracts throughout the two States. Ferguson says it is confined to the hills; I met it from an altitude of about 200 ft. (Thattākād) up to 5,000 ft., but as in the Nilgiris it probably occurs still higher up.

The birds move about in noisy parties of 5 to 7 or more, feeding on the berries of many forest trees, and are frequently met with in the localised bird associations.

In the Pālnis, according to Fairbank (*S.F.*, v, 405), it occurs in small flocks from about 4,000 ft. up. It is generally distributed as a forest bird in Ceylon with no difference of race.

Breeding: Specimens Nos. 32 (7 January) and 208 (3 February) had undeveloped gonads, but on 7 February (Thattākād) a nest was found with one of the owners brooding. It was a flimsy cup of leaf-stalks etc. slung hammockwise in the horizontal fork of a small twig of *Irul* (*Xylia xylocarpa*) overhanging the old High Range Road, at a height of about 7 ft. The nest contained c/2 (fresh), pinkish-white in ground colour with faint and fine phantom specks of reddish-brown, especially about the broad end. Both the eggs measured 23×16 mm. The parent sat very close for a time when I was under the nest, peering at me over the brim, but finally its courage failed and it departed in haste! Another bird on the same date was observed carrying a caterpillar in its bill to nest young. Inspite of breeding being in progress, most birds continued to remain in feeding parties.

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No. 432 (9 March) is a juvenile just out of nest and about a fortnight old. While examining this specimen Mr. Whistler remarks that he cannot help feeling there must have been an error somewhere as it agrees with *Pycnonotus luteolus* in every respect and has no resemblance to *Iole*, whereas by all the rules of the family the young of *Iole* should resemble the adult fairly closely! I can only reply to this by saying that I have 'no possible probable shadow of doubt' that the young is *Iole* and none other. It was being fed and fussed over by the parents when shot. Besides the biotope at Camp Derāmalāi was totally unsuitable for *Pycnonotus luteolus* which was not seen in this locality at all.

In the Nelliampathies where Kinloch describes it as extremely common, he found the usual noisy flocks broken up into pairs in February. He took eggs in that month (*Nidification*, i, 387) though in Travancore Stewart found March and April to be the usual breeding months.

According to the *Fauna* (vol. i, p. 405) the Yellow-browed Bulbul breeds principally in February and March from Kanara to Travancore, and this is confirmed by the data now obtained by the Surveys.

Pycnonotus xantholæmus (Jerdon). The Yellow-throated Bulbul.

Not met with by the Surveys, neither do Hume, Ferguson or any others record it from Travancore nor Kinloch from the Nelliampathy Hills.

Travancore has been included in its 'Distribution' (*Fauna*, i, 415) on the strength of a single specimen obtained by William Davison at 4,020 ft. in the Annemalāi Hills at about 10°N. lat. and 'considerably to the West'. This would mean somewhere in the neighbourhood of Devikolam and about the junction of the High Range and Cardamom Hills sections. According to the collector this was the only example seen by him in two weeks (*Ibis* 1886, p. 146). The bird can therefore have been no more than an aberrant straggler beyond the extreme edge of its range, and in the absence of any further authentic evidence of its occurrence in Travancore, the inclusion of this area in the accepted distribution seems scarcely justified.

Pycnonotus gularis (Gould). The Ruby-throated Bulbul.

Specimens collected: 215 ♂, 216 ♀ 4-2-33 Thattākād 200 ft.; 446 ♂ 16-3-33 Rājampāra 1,350 ft.; 807 ♀ 8-8-33 (Mūkūnnimalāi 800 ft.) Trivandrum Environs; 919 ♂ 29-11-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Ūrūmbikera Res: Forest near Mūndakāyam (ca. 1,000 ft.), Periyār Lake Environs near Kūmili, Tenmalāi (500 ft.), Balamore Estate (2,000 ft.); Kūvalle Incline (Cochin Forest Tramway); Kūriārkūtti (1,600 ft.); Pādagiri (3,000 ft.).

Colours of bare parts: Iris creamy-white; bill brownish-black; mouth yellowish-pink; legs, feet and claws horny-brown.

[The specimens measure:

	Bill.	Wing.	Tail.
3 ♂♂	15.5-16	74.5-77	68-70 mm.
2 ♀♀	14.5-15	72.5-75	67-68 mm.—H. W.]

The Ruby-throated Bulbul is not as uncommon as Ferguson's remarks (*J.B.N.H.S.*, xv, 264) would lead one to expect. I met it from about 200 ft. elevation up to 3,000 ft. but not higher, and it seems to have a decided preference for the hummocky foothills. Though a bird of evergreen forest in the sense that it is never found away from it, it is really the intermediate zone with a mixture of evergreen and deciduous vegetation—more correctly the edge of evergreen forest where land once cleared for rubber or other cultivation has become covered with secondary growth and tangles of *Mimosa*, *Mezoneuron* and the like—that is most suited to its taste. On the ghat road from Nemmāra to Pādagiri, Ruby-throated Bulbuls appeared as soon as about 1,500 ft. was reached and the requisite type of country commenced.

A specimen obtained by W. Daly on Mount Stewart in the Annemalāi Hills is in the Indian Museum. Fairbank (*S.F.*, v, 405) obtained a single specimen at Vengayam Parry (Pālni Hills) in 1867 but was never able to meet the bird there again, from which one may gather that it is very rare in those hills. It is not found in Ceylon.

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In general habits it closely resembles both *Molpastes* and *Otocompsa* but is shyer and more retiring. It has a very pleasant song something of a cross between the song of *Otocompsa* and that of *Leucocirca aureola*. Many of the notes and bars are identically those of the latter but uttered with the richness and volume of the former.

Many species of berries are eaten and the various *Ficus* figs also form an important part of the dietary.

Breeding: In specimen No. 919 (29 November) the testes measured 3×2 mm. In 215 (4 February) they were also 3×2 mm., while in 446 (16 March) they had enlarged to 5×3 mm. and the bird was completing pre-nuptial body moult.

The example (No. 807) procured by Pillai on 8 August had mature ovary, the largest follicle measuring about 4 mm. in diameter, and the bird was probably breeding.

In the absence of more precise data it would appear that the breeding season of this Bulbul is ill-defined. The *Fauna* (vol. i, 416) is silent on the point though a detailed description of the nests and eggs is given. *Nidification* (i, 397) mentions a c/2 taken by Stewart in Travancore Hills on 6 March.

Pycnonotus luteolus luteolus (Lesson). The White-browed Bulbul.

Specimens collected: 594 ♂ 15-4-33, 614 ♂, 615 ♂ (juv.) 18-4-33 Arāmboli 250 ft.; 848 ♂ 13-8-33 (Nettāyam 200 ft.); Trivandrum Environs; 947 ♂ 6-12-33 Nemmāra 300 ft.

Elsewhere noted at: Marāiyūr (3,500 ft.), Kottāyam (ca. S.L.), Wadakkāncheri (400 ft.), Trichūr, Karūpadanna (ca. S.L.), Cranganoor Fort. In the Trivandrum Museum I have seen specimens from Ponmūdi and Arāmboli, and several others without data.

Colours of bare parts: *Adult*: Iris reddish-brown; bill brownish-black; mouth yellowish-pink; legs, feet and claws dark plumbeous or blackish-brown. *Juvenile* (No. 615): Iris hazel brown; bill horny-brown.

[The Survey specimens measure:

	Bill.	Wing.	Tail.
5 ♂♂	18.5-20.5	82-90.5	76-80 mm.

Other specimens examined:

Brit. Mus. Coll.: o? 6-6-77 East base of Pālnis (Fairbank); ♂ 16-11-78 Trivandrum (Bourdillon).

Travancore birds must be put definitely with the Indian race and not the smaller Ceylon race.

Juvenile No. 615 is very similar to the adult but the upper parts and gorget are duller and browner in tint. The first primary is soft and rounded and the tail feathers are softer and more pointed.—H. W.]

Unlike the Yellow-browed Bulbul this species is exclusively an inhabitant of more or less dry open bush-and-scrub country and avoids forest. It is not uncommon, but is confined to the low country in Travancore and Cochin with the only exception of Marāiyūr where it was present in the valley among scrub patches bordering the terraced paddy-fields and in the vicinity of the camp-shed. That it does not ascend the hills in this area of heavy rainfall as it does in the Eastern Ghats ('from sea-level to 4,000 ft.'—*J.B.N.H.S.*, xxxv, 759) is doubtless due to the fact that here the hills are either open and grass-covered or clothed in evergreen jungle and lacking in the dry bush-and-scrub country that forms its habitat.

In the Pālnis also Fairbank (*S.F.*, v, 405) found it common only at the east base of the hills.

In Ceylon this Bulbul is represented by the smaller race *P. l. insulae*.

Breeding: Specimen No. 947 (6 December) showed no genital development. No. 594 (15 April) with testes 6×5 mm. was evidently breeding. In No. 614 (18 April) the testes measured ca. 3×2 mm. and were apparently reverting to the normal non-breeding condition. It was accompanied by No. 615 (with very soft skull) in juvenile plumage and with the rectrices and remiges only partially grown. The birds at Arāmboli between 15 and 22 April were mostly accompanied by young in various stages from which it may be inferred that

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the breeding season is March and April, possibly beginning earlier—in February —and continuing later as suggested by No. 848 which had an imperfectly ossified skull as late as 13 August.

Microtarsus poiocephalus (Jerdon). The Grey-headed Bulbul.

Specimens collected: 201 ♂ 3-2-33, 230 ♀ 7-2-33, 249 ♂ 9-2-33, 278 ♂ 12-2-33 Thattākād 200 ft.; 429 ♂ 9-3-33 Camp Derāmalāi 3,000 ft.; 476 ♂ 20-3-33 Rājampāra 1,350 ft.; 653 ♂ 24-4-33 Balamore Estate 2,000 ft.

Elsewhere noted at: Ūrūmbikera Res. Forest near Mūndakāyam (1,000 ft.), Tenmalāi (500 ft.), Kūriārkūtti (1,600 ft.), Wadakkāncheri (400 ft.).

I have seen specimens in the Trivandrum Museum from Kūttyāni (Sex ?, 25-5-95) and Ponmūdi (December 1890, and others).

Colours of bare parts: Iris grey; bill greenish-yellow; mouth pink with brownish patches or yellow and pink, perhaps varying according to age (or season ?); legs and feet pale dusky orange-yellow; claws paler.

[The Survey specimens measure:

	Bill.	Wing.	Tail.
6 ♂♂	14.5-17.5	75.5-78.5	70.5-77 mm.
1 ♀	16	75.5	73 mm.

The juvenile of this species appears to be quite unknown and no hint of the plumage stages is afforded by this fine series all of which are in full plumage with no moult other than odd body feathers.—H. W.]

The Grey-headed Bulbul is one of the species confined to the heavy rainfall area of South-West India, the other members of the genus being dwellers of parallel biotope in the Indian Empire and beyond its eastern borders.

Ferguson mentions that in Travancore he found this bird only on the hills at about 2,000 ft. altitude, but that he shot one at Kūttyāni, an exceptional locality in the low country where the old forest was still standing. This is undoubtedly the specimen now in the Trivandrum Museum. Mr. Pillai who visited Kūttyāni in August 1933 reports that most of the forest has now been cleared and he apparently did not come across this species there. Ferguson's experience shows how very closely knit this form is with evergreen forest, a fact which my experience in Travancore-Cochin fully confirms. The biotope it frequents is very similar to that of *P. gularis* but it usually prefers even more humid facies with denser gowth and often a good deal of rattan (*Calamus*) intermixed.

The only notes I heard this Bulbul utter were a single harsh *chaik, chaik*, frequently followed by a squeaky *cheek* or *pink* (the latter somewhat reminiscent of a finch or *Dendronanthus*—) repeated every second or so. The birds were seen both in pairs and gregariously feeding largely on several kinds of Ficus figs in company with *Iole, Thereiceryx* and other frugivorous species. When dead and in the hand, the bird bears a curious resemblance to a miniature green pigeon! This species is absent in Ceylon.

Breeding: In No. 201 (3 February) the testes measured 3×2 mm. and the bird appeared to be preparing to breed; 230 (7 February) likewise had a distinctly granulated ovary; in both 249 (9 February) and 278 (12 February) the organs were as in 201. Nos. 429 (9 March—testes 4×3 mm.), 476 (20 March —testis (only one !) 6×4 mm.) and 653 (24 April—testis (again only one !) 5×4 mm.), were also ready to breed if not doing so at the time. Indeed in the last there was an incubation patch to justify this presumption. All the specimens were in fresh plumage.

The *Fauna* (i, 426) as well as *Nidification* (vol. i, p. 407) give a description of nests and eggs, invariably c/1, obtained in Travancore by Stewart and Bourdillon. According to the former the breeding season is April and May.

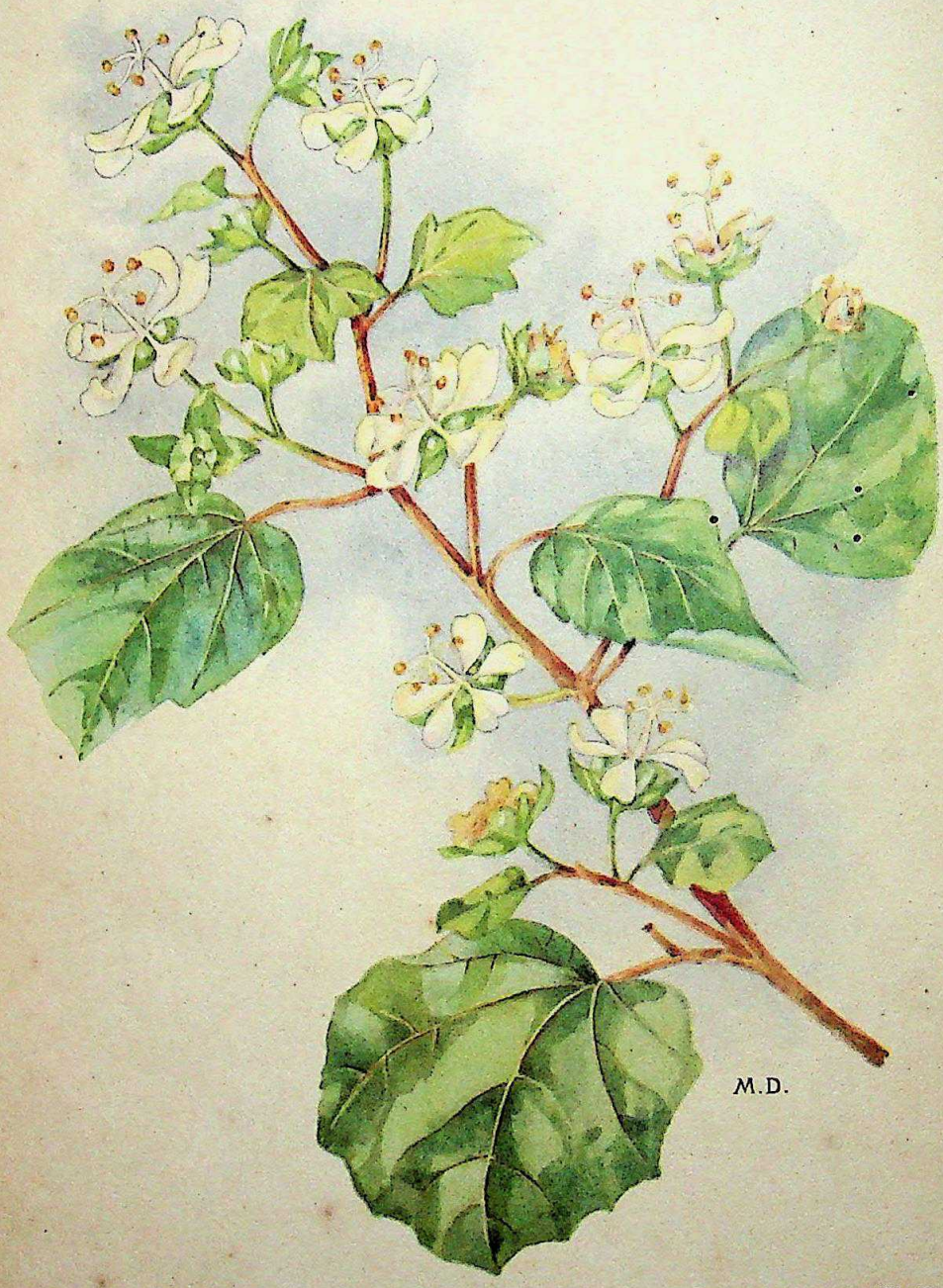
(To be continued).

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ROXBURGH'S KYDIA.

Kydia calycina Roxb.

(about 2/3 nat. size).

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SOME BEAUTIFUL INDIAN TREES.

BY

THE LATE E. BLATTER, S.J., PH.D., F.L.S.,

and W. S. MILLARD, F.Z.S.

PART XVIII.

(*With one coloured plate and two text-figures*).

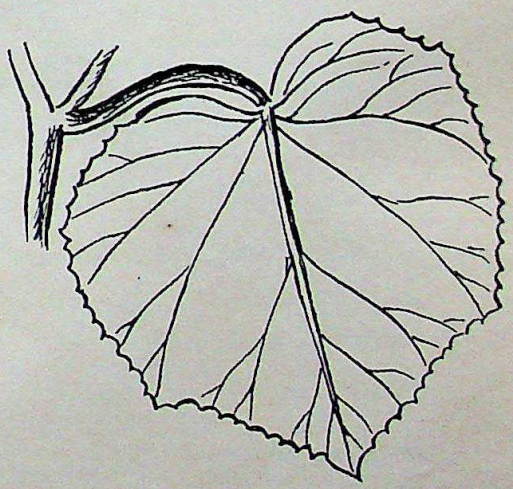
(*Continued from page* 750 *of volume* XXXVII).

PLATE XXVI.—ROXBURGH'S KYDIA.

Popular Names: Pula, Puli, Patha (Hind.); Bargah, Baranga (C.P.); Kopasia (Uriya); Warung, Iliya (Mar.); Bellaka, Bendi (Kan.); Potri, Kandiki (Tel.); Tabo, Dwalok, Myethlwa (Burm.).

Kydia calycina Roxb. Hort. Beng. (1814), p. 51. Belongs to the family *Malvaceae*. The genus is named after Colonel Robert Kyd, founder and first Director of the Royal Botanic Gardens, Calcutta, who died in 1794. The specific name is with reference to the prominent calyx.

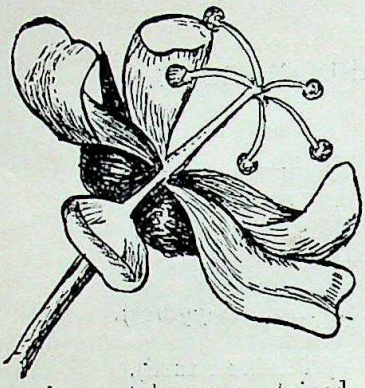
Description: A large shrub or small tree. Leaves 3-6 in. long, fanwisely 7-nerved, heart-shaped at the base, usually 3-7 lobed; lobes often angular, the median one the largest, smooth above, densely close haired beneath; leaf-stalk 1-2 in. long. Panicles many flowered, covered with tawny short hairs, flower-stalk $\frac{3}{8}$ in. long. Below the calyx there is a series of 4-6 strongly nerved involucral bracts which enlarge and persist in fruit, $\frac{1}{4}$-$\frac{3}{8}$ in. long. Corolla white or pink, petals reversedly heart-shaped, longer than the calyx, prolonged into a claw at the base with a tuft of hairs on either side. The filaments are united to form a staminal tube for a little more than half their length then dividing into 5 spreading branches, each carrying 3 almost stalkless anthers. Style branches 3, each surmounted by a large disc-like stigma. Fruit 3-valved, about the size of a pea, covered with mealy dust, rounded with a slightly umbrella-shaped top. Seeds kidney-shaped, striated, brown-black.



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Distribution: Common throughout India and Burma chiefly in mixed and deciduous forests not in arid regions.



Gardening: Propagated from seed. The seeds possess a comparatively low germinating power but this is compensated by the large number produced. The seeds should be sown in seed beds, and the seedlings transplanted when they are 2-3 in. high. The rate of growth is rapid and it has been estimated that the tree reaches its maximum growth at a comparatively early age, though the exact age has not been ascertained (Troup).

The leaves commence to fall at the end of November and the plant is leafless from January or early February to late April. The flowers appear in September-October, and the masses of greenish white or pale lilac blossoms make the tree a conspicuous sight at this season (Troup).

Uses: The inner bark yields a bast fibre used for coarse ropes etc. The fibre has a high resisting power to decomposition by moisture.

(*To be continued*).

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A LIST OF THE BIRDS OF THE CENTRAL PROVINCES.

BY

E. A. D'ABREU, F.Z.S.

(*Curator, Central Museum, Nagpur*).

The following is a brief list of the birds of the Central Provinces which I have collected, observed, or I am otherwise aware of during a residence of over twenty years. Species which are probably to be found but which I have not yet observed or identified with certainty are enclosed in brackets. Every part of the Provinces has not been visited by me and most of the observations have been made at Nagpur, or in the districts during the winter months. In 1923 I published a list of the Central Provinces Birds in Record No. III of the Nagpur Museum. This list is now out of date as many alterations and additions have become necessary.

ORDER: PASSERES.

1. [**Corvus corax laurencei** (Hume). The Punjab Raven.
A rare straggler in Berar.]

2. **Corvus macrorhynchos culminatus** Sykes. The Indian Jungle-Crow.
Resident, breeds February to April.

3. **Corvus splendens splendens** (Vieill.). The Indian House-Crow.
Resident. Breeds in June and July. An albino was secured at Kodamendhi, Nagpur District, by Mr. P. G. H. Stent, I.C.S.

4. **Dendrocitta v. vagabunda** (Lath.). The Bengal Tree-Pie.
Resident. It is probably a local migrant; at Nagpur, they are not seen till September and they disappear again when the weather gets warm.

5. [**Dendrocitta leucogastra** (Gould). The Southern Tree-Pie.
McMaster records a specimen from Chikalda.]

6. **Parus major mahrattarum** Hartert. The Southern Grey-Tit.
Resident in elevated and well-wooded parts of the Provinces. Not as common as the next species.

7. **Machlolophus xanthogenys aplonotus** (Blyth). The Central India Yellow-cheeked Tit.
Resident and common in well-wooded tracts.

8. **Sitta castanea castanea** Less. The Chestnut-bellied Nuthatch.
Breeds April to May (Pachmarhi).

9. **Sitta castanea prateri** Whist. Prater's Nuthatch.
A specimen obtained at Damarincha, Ahiri State.

10. **Sitta frontalis frontalis** (Horsf.). The Velvet-fronted Blue Nuthatch.
Has been observed at Saugor and Betul.

11. **Turdoides terricolor terricolor** (Hodg.). The Bengal Jungle Babbler.
A very common resident. Breeds chiefly from June to July.

12. **Turdoides striatus polioplocamus** Ob. The White-headed Babbler.
Resident in South Chanda.

13. **Argya caudata caudata** (Dum.). The Common Babbler.
A common resident.

14. **Argya malcolmi** (Sykes). The Large Grey Babbler.
A common resident.

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15. **Pomatorhinus horsfieldi obscurus** (Hume). Hume's Scimitar-Babbler.
Most probably a resident in the Satpura Plateau; specimens recorded from Seoni, Dhupgarh near Pachmarhi (Osmaston) and Balaghat (Baihar Tahsil). Whether the birds seen by me in the Balaghat District were this or the sub-species *P. n. horsfieldi*, the Deccan Scimitar-Babbler, I am unable to tell, as the birds were not secured.

16. **Dumetia hyperythra** (Franklin). The Rufous-bellied Babbler.
A common resident throughout the well-wooded parts. Breeds late, June to September.

17. **Chrysomma sinensis sinensis** (Gm.). The Indian Yellow-eyed Babbler.
Resident throughout the Provinces. Breeds June to September. Clutches, even from the same locality, appear to belong to two distinct types. In one the eggs are smaller and speckled with red resembling eggs of *D. hyperythra*; in the other the eggs are larger and heavily blotched and streaked with red.

18. **Pellorneum ruficeps ruficeps** (Swain). The Indian Spotted Babbler.
Fairly common at Pachmarhi where it breeds May to June (Osmaston).

19. **Mixornis gularis rubricapilla** (Tick.). The Yellow-breasted Babbler.
Three specimens of this bird were obtained by me at Parasgaon in the Bastar State.

20. **Alcippe poioicephala brucei** (Hume). The Bombay Quaker-Babbler.
I obtained a specimen in the Bastar State and found it common in the Baihar Tahsil of the Balaghat District. It is not uncommon at Pachmarhi where it breeds early in July.

21. **Aegithina tiphia humei** S. B. The Central Indian Iora.
A common resident. Breeds June to July.

22. [**Aegithina nigrolutea** (Marsh.). Marshall's Iora.
Occasionally found in the Northern parts of the Provinces.]

23. **Chloropsis aurifrons davidsoni** (Bak.). The Malabar Chloropsis.
Mr. Master records this species from Chikalda in Berar and I found it on the banks of the Indravati in the Ahiri State.

24. **Chloropsis jerdoni** (Blyth). Jerdon's Chloropsis.
Resident throughout the Provinces. Breeds June to July.

25. [**Hypsipetes psaroides ganeesa** (Sykes). The Southern Indian Black Bulbul.
McMaster procured this bird at Chikalda on the Gawilgarh hills in Berar.]

26. **Molpastes cafer cafer** Linn. The Madras Red-vented Bulbul.
Common resident. Breeds May to August.
The Bulbuls of the Jubbulpore District are intermediate between the Central Indian Bulbul (*M. c. pallidus*) and the Bengal Bulbul (*M. c. benghalensis*). They are larger birds with a wing measurement of about 100 mm. The Bulbuls from the south-eastern parts of the Provinces will probably turn out to be *M. c. saturatus*, K. & W. but specimens have not yet been examined.

27. [**Molpastes leucogenys leucotis** (Gould). The White-eared Bulbul.
Found north of the Nerbudda extending east to Hoshangabad and Saugor. I have not observed this bird personally.]

28. **Otocompsa jocosa emeria** (Linn.). The Bengal Red-whiskered Bulbul.
I secured one of a pair at Nagpur on the 7th April 1932.

29. **Otocompsa jocosa fuscicaudata** (Gould). The Southern Red-whiskered Bulbul.
This Bulbul is found in the Melghat and I have observed it in the Balaghat and Chhindwara Districts and also at Pachmarhi, where it breeds from April to July but the birds from the three latter localities have not been examined.

30. **Otocompsa flaviventris flaviventris** (Tick.). The Black-crested Yellow Bulbul.
Resident at Pachmarhi, where it breeds in June.

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31. **Pycnonotus luteolus** (Less.). The White-browed Bulbul.
Resident at Nagpur and Kamptee, but not plentiful. Breeds in June. This bird shuns observation though its call is familiar.

32. **Salpornis spilonotus** (Frankl.). The Spotted Grey Tree-Creeper.
A rare resident. I got a specimen at Nagpur, another in the Chanda forests, and a third in the Betul District.

33. **Saxicola caprata bicolor** (Sykes). The Northern India Pied Bush-Chat.
A winter visitor to the Provinces.

34. **Saxicola caprata burmanica** S. B. Indo-Burmese Pied Bush-Chat.
Resident. Breeds in April and May.

35. **Saxicola torquata indica** (Blyth). The Indian Bush-Chat.
A common winter visitor.

36. [**Œnanthe opistholeuca** (Strick.). Strickland's Chat.
A winter visitor as far south as Nagpur according to Oates.]

37. **Cercomela fusca** (Blyth). The Brown Rock-Chat.
Resident in the Jubbulpore, Saugor, Damoh and Hoshangabad Districts, but probably has a wider range. Breeds March to July in holes of walls, quarries, cliffs, etc.

38. **Phoenicurus ochrurus phoenicuroides** (Vieill.). The Black Redstart.
A common winter visitor. It appears at Nagpur on or about the 23rd September.

39. **Cyanosylvia suecica** (L.). The Blue-throat.
A common winter visitor.

40. **Calliope calliope** (Pall.). The Common Ruby-throat.
A rare winter visitor. A specimen was secured at Lamta in the Balaghat District.

41. **Saxicoloides fulicata cambaiensis** (Lath.). The Brown-backed Indian Robin.
A common resident north of the Taptee River.

42. **Saxicoloides fulicata intermedia** Whistler and Kinnear.
Resident south of the Taptee River.

43. **Copsychus saularis saularis** (Linn.). The Indian Magpie-Robin.
A very common resident. Breeds May to July.

44. **Kittacincla malabarica malabarica** Scop. The Shama.
Has been recorded from Raipur.

45. **Turdus simillimus mahrattensis** Whist. The Black-capped Black-bird.
Rare, but may possibly breed in the Provinces. It has been recorded at Chikalda and I got specimens at Khawasa in the Seoni District and one at Nagpur.

46. [**Turdus unicolor** Tick. Tickell's Thrush.
A winter visitor, has been taken at Raipur.]

47. **Geokichla citrina citrina** (Lath.). The Orange-headed Ground-Thrush.
Probably found sparingly in the Provinces during the winter only. There is a specimen from Raipur in the British Museum.

48. **Geokichla citrina cyanotis** (Jard. & Sel.). The White-throated Ground Thrush.
Resident in the well-wooded tracts. Breeds June to July.

49. **Monticola cinclorhyncha** (Vig.). The Blue-headed Rock Thrush.
A winter visitor, a few specimens have been obtained at Nagpur.

50. **Monticola solitaria pandoo** Sykes. The Blue Rock-Thrush.
A winter visitor to the whole of the Provinces.

51. **Myiophonus horsfieldi** (Vigors). The Malabar Whistling-Thrush.
Resident in parts of the Provinces; very common at Pachmarhi and the Melghat and also recorded in the Sirguja State. Breeds June to July, placing its nest in crevices in more or less vertical rocks in ravines.

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52. **Siphia parva parva** (Bechst.). The European Red-breasted Flycatcher.
A common winter visitor.

53. **Muscicapula superciliaris superciliaris** (Jerd.). The White-browed Blue Flycatcher.
A winter visitor has been taken in the Nagpur, Chanda, Balaghat and Chhindwara Districts.

54. **Muscicapula tickelliae tickelliae** (Blyth). Tickell's Blue Flycatcher.
A common resident. Breeds in May and June.

55. **Eumylas thalassina thalassina** (Swain). The Verditer Flycatcher.
A winter visitor.

56. **Alseonax latirostris** (Raff.). The Brown Flycatcher.
Resident.

56A. **Alseonax ruficaudatus.** Rufous-tailed Flycatcher.
A specimen secured by me at Nagpur on 30th October 1934.

57. **Calicicapa c. ceylonensis** (Swain). The Grey-headed Flycatcher.
Common in winter. Recorded breeding at Pachmarhi in June and July.

58. **Tchitrea paradisi paradisi** (L.). The Indian Paradise Flycatcher.
Resident. Breeds June to July.

59. **Hypothymis azurea styani** Hartl. The Indian Black-naped Flycatcher.
Resident, but keeps to well-wooded tracts. Breeds June to August.

60. **Leucocera aureola aureola** (Less.). The White-browed Flycatcher.
This race has been taken in the winter only at Nagpur and may be the resident bird in the north of the Province. It sometimes attends cattle, snapping up the insects disturbed by the animals.

(a) **Leucocerca aureola compressirostris** Blyth. The Southern White-browed Fantail Flycatcher.
This is the breeding bird at Nagpur.

61. **Leucocerca pectoralis** (Jerd.). The White-spotted Fantail Flycatcher.
Resident probably throughout the Provinces. Very common in the Districts of Nagpur, Balaghat and Chanda. Breeds March to July.

62. **Lanius excubitor lahtora** (Sykes). The Indian Grey Shrike.
Resident. Breeds March to May.

63. **Lanius vittatus** (Val.). The Bay-backed Shrike.
One of the commonest shrikes in the Provinces. Breeds June to July.

64. **Lanius nasutus nigriceps** (Frank.). The Southern Black-headed Shrike.
No records of its breeding in the Province, but birds have been secured in the winter months from Bastar, Bilaspur and Nagpur.

65. **Lanius schach erythronotus** (Vig.). The Rufous-backed Shrike.
A winter visitor recorded as far south as Parasgaon in the Bastar State. Has been taken at Nagpur on 18th April 1920. They breed in the northern districts.

66. **Lanius schach caniceps** Blyth. Southern Grey-backed Shrike.
Resident. Breeds chiefly in June.

67. **Lanius schach tephronotus** Vig. The Central Himalayan Grey-backed Shrike.
A straggler into the Provinces in winter. I took a specimen at Ahiri in the Chanda District.

68. **Lanius cristatus cristatus** (L.). The Brown Shrike.
A winter visitor throughout the Provinces. Arriving at Nagpur on September 4th and staying till April 30th.

69. **Hemipus picatus picatus** (Sykes). The Black-backed Pied-Shrike.
Resident in the Satpura Plateau Districts according to Moss-King.

70. **Tephrodornis p. pondicerianus** (Gmel.). The Common Wood-Shrike.
Resident and common throughout the Provinces.

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71. **Pericrocotus speciosus semiruber** Whist. The Southern Scarlet Minivet.
Not common. I have observed it in the districts of Balaghat, Chhindwara, Betul and the Bastar State. It has also been observed at Pachmarhi. Keeps to well-wooded localities. A party when disturbed were noticed making for trees with red leaves.

72. [**Pericrocotus brevirostris brevirostris** Vig. The Indian Short-billed Minivet.
A rare winter visitor.]

73. **Pericrocotus roseus roseus** (Vieill.). The Rosy Minivet.
Three specimens were obtained at Nagpur.

74. **Pericrocotus peregrinus perigrinus** (L.). The Small Minivet.
A common resident. Breeds February to July.

75. **Pericrocotus erythropygius** (Jerd.). The White-bellied Minivet.
Resident, but not common. Breeds in July and August.

76. **Lalage melanoschista melanoschista** (Hodg.). The Dark-grey Cuckoo-Shrike.
I have taken this bird in the Bastar State only.

77. **Lalage sykesi** (Strick.). The Black-headed Cuckoo-Shrike.
Resident. Breeds May to July.

78. **Graucalus javensis macei** (Less.). The Large Cuckoo-Shrike.
A common resident. Breeds April to June.

79. **Dicrurus macrocercus peninsularis** Ticehurst. The Southern Black Drongo.
Common resident. Breeding May to July. Both the spotted and unspotted varieties of eggs have been observed.

80. **Dicrurus leucophaeus longicaudatus** (Hay). The Indian Ashy Drongo.
Taken at Nagpur from February to April.

81. **Dicrurus c. caerulescens** (Linn.). The White-bellied Drongo.
Resident, but probably a local migrant. Keeps to well-wooded localities and only seen at Nagpur during the cold months (date of arrival is 22nd September). Recorded breeding at Pachmarhi from March to April.

82. [**Chaptia aenea malayensis** (Hay). The Southern Bronzed Drongo.
Jerdon has recorded this bird from the Bastar State, but it has not again been observed by others.]

83. **Chibia hottentotta hottentotta** (L.). The Indian Hair-crested Drongo.
Probably resident, has been observed at Raipur and Balaghat and taken at Nagpur.

84. **Dissemurus paradiseus grandis** (Gould). The Assam Racket-tailed Drongo.
Resident, but keeping to well-wooded parts. Breeds chiefly in May and June.

85. **Dissemurus paradiseus malabaricus** Lath. The Malabar Large Racket-tailed Drongo.
This is the form found at Nagpur and the Bhandara Districts.

86. [**Locustella naevia straminea** (Severty). The Turkestan Grass-hopper Warbler.
Possibly a winter visitor, not observed by me.]

87. **Acrocephalus stentoreus brunnescens** (Jerd.). The Indian Great Reed-Warbler.
A common winter visitor, some birds having been observed on 23rd April at Nagpur. It may possibly breed in the Provinces.

88. **Acrocephalus dumetorum** (Blyth). Blyth's Reed-Warbler.
A common winter visitor, taken in Nagpur as early as 4th October.

89. [**Acrocephalus agricola agricola** (Jerd.). The Paddy-field Reed-Warbler.
A winter visitor.]

90. **Orthotomus sutorius guzurata** Lath. The Indian Tailor-bird.
A common resident. Clutches taken in June and July, but probably breeds both earlier and later.

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91. **Cisticola exilis erythrocephala** Blyth. The Red-headed Fantail-Warbler.
Recorded from Saugor and a specimen was secured by me at Khapa in the Balaghat District.

92. **Cisticola juncidis cursitans** (Frankl.). The Streaked Fantail-Warbler.
Resident throughout the Provinces. Breeds August to October.

93. **Franklinia gracilis** (Frankl.). Franklin's Wren-Warbler.
Resident. Breeds during the rains.

94. **Franklinia buchanani** (Blyth). The Rufous-fronted Wren-Warbler.
A specimen was obtained in June at Nagpur and recorded breeding at Saugor.

95. **Megalurus palustris** (Horsf.). The Striated Marsh-Warbler.
Resident in parts of the Provinces, e.g., Hoshangabad and Seoni. Breeds in April.

96. **Chaetornis striatus** Jerd. The Bristled Grass-Warbler.
Resident. Has been recorded from Seoni, Saugor, Raipur and observed breeding at Kamptee in September.

97. **Hypolais rama rama** (Sykes). Sykes' Tree-Warbler.
A common winter visitor, arriving early in September.

98. **Hypolais rama scita** (Eversmann). The Booted Tree-Warbler.
A winter visitor.

99. **Sylvia hortensis jerdoni** Blyth. The Eastern Orphean-Warbler.
A winter visitor. Specimens have been observed or taken in Chanda, Nagpur and in the Melghat.

100. **Sylvia curruca affinis** (Blyth). The Indian Lesser White-throated Warbler.
Very common at Nagpur in the winter.

101. **Phylloscopus collybita tristis** (Blyth). The Brown Willow-Warbler.
A winter visitor. Has been taken at Chhindwara.

102. **Phylloscopus griseolus** Blyth. The Olivaceous Willow-Warbler.
A common winter visitor. It has been observed in the districts of Nagpur, Balaghat, Chanda, Bastar and also at Pachmarhi. It frequently creeps about branches and tree trunks after the fashion of a nuthatch.

103. **Phylloscopus inornatus humei** Brooks. Hume's Willow-Warbler.
A winter visitor. Has been obtained at Nagpur, Bhandara and Mandla.

104. [**Phylloscopus nitidus nitidus** (Blyth). The Green Willow-Warbler.
A winter visitor. Not yet secured.]

105. **Phylloscopus nitidus viridanus** (Blyth). The Greenish Willow-Warbler.
Very common throughout the winter.

106. **Phylloscopus magnirostris** (Blyth). The Large-billed Willow-Warbler.
A winter visitor. Has been taken at Nagpur.

107. [**Phylloscopus occipitalis occipitalis** (Blyth). The Large-crowned Willow-Warbler.
A winter visitor.]

108. [**Seicercus burkii** (Burton). The Black-browed Flycatcher-Warbler.
McMaster records this species from Kamptee and Chikalda.]

109. **Prinia socialis** (Sykes). The Ashy Wren-Warbler.
A common resident.

110. **Prinia sylvatica sylvatica** (Jerd.). The Jungle Wren-Warbler.
Resident. Breeds June to September.

111. **Prinia inornata inornata** (Sykes). The Indian Wren-Warbler.
A common resident. Breeds from August to October, if not throughout the rains.

112. [**Cephalopyrus flammiceps** (Burton). The Fire-capped Tit-Warbler.
A winter visitor, specimens have been taken at Raipur, Saugor and Nagpur.]

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113. **Oriolus oriolus kundoo** (Sykes). The Indian Oriole.
A common resident. Breeds May to July.

114. **Oriolus xanthornus maderaspatanus** Franklin. The Indian Black-headed Oriole.
Resident, but more in evidence in well-wooded localities. Breeds May to July.

115. **Gracula religiosa intermedia** (Hay). The Indian Grackle.
Resident in the Bastar State. Breeds from March to May.

116. **Pastor roseus** (L.). The Rose-coloured Starling.
Visits the Provinces in large numbers in the cold weather.

117. **Sturnus vulgaris poltaratskii** (Finsch.). The Indian or Finsch's Starling.
A winter visitor to the Northern districts.

118. **Sturnia malabarica malabarica** (Gm.). The Grey-headed Myna.
Taken in the Bastar State and also observed at Nagpur.

119. **Temenuchus pagodarum** (Gm.). The Black-headed Myna.
A common resident. Breeds from May to August in holes in trees.

120. **Acridotheres t. tristis** (L.). The Common Myna.
Resident, and very common everywhere. Breeds April to July.

121. **Acridotheres ginginianus** (Lath.). The Bank Myna.
Resident in the Nerbudda Valley and in the eastern portions of the Provinces. I found it common in the Kanker State and it extends west to Ramtek and Kamptee. Breeds in June excavating a nest chamber in the vertical banks of rivers or in the sides of wells.

122. **Sturnopastor contra** (L.). The Pied Myna.
Resident throughout the Provinces, but more common to the east and probably absent in the west. Breeds May to July, constructing a massive nest on the branch of a tree.

123. **Ploceus philippinus** (L.). The Baya.
Resident in the open country.

124. [**Ploceus benghalensis** (L.). The Black-throated Weaver-Bird.
Probably resident in the Northern districts. Breeds in the rains.]

125. **Munia malacca** (L.). The Black-headed Munia.
Observed at Pachmarhi by Bates and observed breeding in the east of Bhandara District by F. R. Blewitt on the 19th July.

126. [**Munia atricapilla** (Vieill.). The Chestnut-bellied Munia.
May be resident in the Eastern districts. Breeding June to September in swampy localities.].

127. **Uroloncha striata striata** (L.). The White-backed Munia.
Resident. Very common in the Chanda District, extending north to Bhandara and Betul. Breeds probably throughout the year.

128. **Uroloncha malabarica** (L.). The White-throated Munia.
Common. Breeds February to October.

129. **Uroloncha punctulata lineoventer** Hodg. The Spotted Munia.
Resident. Breeds almost throughout the year.

130. **Stictospiza formosa** (Lath.). The Green Munia.
Resident, observed at Nagpur and at Bhanpuri, Bastar State.

131. **Amandava amandava** (L.). The Indian Red Munia.
Resident. Breeds probably twice in the year. Nests have been taken in September, October and December.

132. **Carpodacus erythrinus** (Pall.). The Common Rose-Finch.
A winter visitor.

133. **Gymnorhis xanthocollis xanthocollis** (Burton). The Yellow-throated Sparrow.
A common resident. Breeds from April to May in holes in trees,

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134. **Passer domesticus indicus** J. & S. The Indian House-Sparrow.
This is the form which is resident at Nagpur.

135. **Emberiza stewarti** (Blyth). The White-capped Bunting.
A specimen was obtained at Nagpur in December.

136. **Emberiza buchanani** (Blyth). The Grey-necked Bunting.
A winter visitor.

137 **Emberiza melanocephala** (Scop). The Black-headed Bunting.
A winter visitor.

138. **Emberiza icterica** Evers. The Red-headed Bunting.
A common winter visitor.

139. **Melophus lathami subcristata** (Sykes). The Crested Bunting.
Resident. Breeds April to August, making a saucer-like nest of grass on the ground or in holes of banks and walls.

140. **Delichon urbica cashmeriensis** (Gould). The Kashmir Martin.
A solitary specimen was obtained by Blanford at Bilaspur in April.

141. **Riparia paludicola brevicaudata** Horsf. The Indian Sand-Martin.
Resident. Keeping to the banks of the larger streams. Breeds November to February in the sandy banks of rivers, constructing a scanty nest at the end of a narrow tunnel about three feet in length.

142. **Krimnochelidon concolor** (Sykes). The Dusky Crag-Martin.
Resident.

143. **Hirundo rustica rustica** (L.). The Common Swallow.
A winter visitor.

144. **Hirundo smithii filifera** Stephens. The Wire-tailed Swallow.
Breeds probably throughout the year.

145. **Hirundo fluvicola** (Jerd.). The Indian Cliff-Swallow.
Resident.

146. **Hirundo daurica nepalensis** (Hodg.). Hodgson's Striated Swallow.
A winter visitor.

147. **Hirundo daurica erythropygia** (Sykes). Sykes' Striated Swallow.
Resident.

148. **Motacilla alba dukhunensis** (Sykes). The Indian White Wagtail.
A common winter visitor.

149. **Motacilla alba personata** (Gould). The Masked Wagtail.
A winter visitor.

150. **Motacilla maderaspatensis** (Gmel.). The Large Pied Wagtail.
Resident.

151. **Motacilla cinerea caspica** Gm. The Eastern Grey Wagtail.
A winter visitor. Arrives at Nagpur on about 20th September.

152. **Motacilla flava thunbergi** (Billberg). The Grey-headed Wagtail.
A winter visitor.

153. **Motacilla flava beema** (Sykes). The Indian Blue-headed Wagtail.
A winter visitor.

154. **Motacilla feldegg feldegg** Mich. The Black-headed Wagtail.
A winter visitor taken at Nagpur.

155. **Motacilla citreola werae** Buturlin. The Yellow-headed Wagtail.
A winter visitor.

156. [**Dendronothus indicus** (Gmel.). The Forest Wagtail.
A rare winter visitor, not yet observed.]

157. **Anthus trivialis haringtoni** With. Witherby's Tree Pipit.
A winter visitor. I have definite records from Melghat and Pachmarhi.

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158. **Anthus t. trivialis** L. The Indian Tree-Pipit
A common winter visitor.

159. [**Anthus leucophrys jerdoni** (Finsch.). The Brown Rock-Pipit.
A winter visitor.]

160. [**Anthus richardi richardi** (Vieill.). Richard's Pipit.
A specimen was obtained at Nagpur.]

161. [**Anthus richardi thermophilus,** Jerd. Blyth's Pipit.
A winter visitor.]

162. **Anthus rufulus** (Vieill.). The Indian Pipit.
A common resident.

163. **Anthus campertris griseus** (Blasius). The Eastern Tawny Pipit.
A winter visitor. Taken at Nagpur, Jubbulpore and the Kankar State.

164. **Alauda gulgula gulgula** (Frank.). The Small Indian Sky Lark.
Resident.

165. **Calandrella brachydactyla dukhunensis** (Sykes). The Rufous Short-toed Lark.
A winter visitor. Found in large flocks. These larks are the so-called Ortolans.

166. **Alaudula raytal raytal** (Blyth). The Ganges Sand-Lark.
Resident. Has been observed breeding in the Saugor and Damoh Districts and in the Nerbudda and Kanhan beds in May.

167. **Mirafra javanica cantillans** (Jerd.). The Singing Bush Lark.
Resident. Breeds in April and again from August to September.

168. [**Mirafra assamica assamica** (McC.). The Bengal Bush-Lark.
Recorded by Murray as resident in the Eastern parts of the Central Provinces.]

169. **Mirafra erythroptera** (Jerd.). The Red-winged Bush-Lark.
Breeds in April and again from July to September.

170. **Galerita cristata chendoola** (Frank.). The Crested Lark.
Resident in the Northern districts where it breeds from April to May.

171. **Galerita deva** (Sykes). Sykes' Crested Lark.
Resident. Breeds May to June.

172. **Ammomanes phoenicura phoenicura** (Frank.). The Rufous-tailed Finch-Lark.
Resident.

173. **Eremopterix grisea** (Scop). The Ashy-crowned Finch-Lark.
Resident. Breeds December to May and again in August and September.

174. **Zosterops palpebrosa occidentis** Ticeh. The North-western White-eye.
Resident.

175. **Aethopyga siparaja seheriae** (Tick.). The Himalayan Yellow-backed Sun-bird.
I shot a male of this species at Lougher in the Balaghat District on the 1st April at an altitude of about 2,000 ft.

176. **Cinnyris asiatica asiatica** (Lath.). The Purple Sun-bird.
A common resident.

177. **Cinnyris zeylonicus** (L.). The Purple-rumped Sun-bird.
A common resident in the eastern parts of the Provinces, Raipur, Bastar, etc., extending west to the Bhandara District, and even to Nagpur where it is scarce.

178. [**Dicaeum concolor subflavum** S. B. The Belgaum Flower-picker.
May be found in the western parts of the Central Provinces.]

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179. **Dicaeum e. erythrhynchos** (Lath.). Tickell's Flower-pecker.
Resident.

180. **Piprisoma agile agile** Tick. The Thick-billed Flower-pecker.
Resident. Breeds February to May.

181. **Pitta brachyura** (Linn.). The Indian Pitta.
Resident. Breeds in June and July, constructing a huge globular nest of twigs and leaves on the ground or on low branches.

Order: Coraciformes.

182. **Picus xan thopygius.** Gray. The Little Scaly-bellied Green Wood-pecker.
Found sparingly in the Bastar State and in the Balaghat District. It is probably resident.

183. **Dryobates m. mahrattensis** (Lath.). The Yellow-fronted Pied Wood-pecker.
A common resident. Breeds February to April.

184. **Dryobates h. hardwickii** (Jerdon). The Southern Pigmy Wood-pecker.
Resident. Common in well-wooded parts. Breeds March to April.

185. **Micropternus brachyurus phaioceps** Blyth. The Orissa Rufous Wood-pecker.
I saw and took specimens of this bird at Khapa in the Balaghat District. Breeds in April and May, constructing its nest within the nest of the black tree ant (*Plagiolepis*).

186. **Brachypternus benghalensis benghalensis** (L.). The Northern Golden-backed Wood-pecker.
A common resident. Breeds January to March. This is the race found at Nagpur and Betul.

187. **Brachypternus benghalensis puncticollis.** Malherbe's Southern Golden-backed Wood-pecker.
This form has been taken in the Chanda and Bhandara Districts, intermediates between the two forms also occur in the latter district.

188. **Chrysocolaptes festivus** (Bodd.). The Black-backed Wood-pecker.
I have taken this bird at Charama in the Kanker State, at Tamia in the Chhindwara District and in the Betul District. It is probably a resident breeding during the cold months and laying a single white egg in a hole in a tree as usual.

189. [**Hemicercus canente cordatus** Jerd. The Heart-spotted Wood-pecker.
Jerdon reported the occurrence of this bird in the Chanda forests, but it has not been observed by anybody since.]

190. **Iynx torquilla** L. The Wryneck.
A winter visitor.

191. **Thereiceryx zeylanicus caniceps** (Frank.). The Northern Green Barbet.
Common in well-wooded localities. Breeds April to May.

192. **Xantholaema haemacephala indica** Lath. The Indian Crimson-breasted Barbet.
Common. Breeds from January to April, earlier in the south.

193. **Cuculus canorus telephonus** (Heine). The Asiatic Cuckoo.
I have regularly observed and heard cuckoos in the Nagpur, Bhandara, Bilaspur and Chanda Districts from April to June the earliest date being the 27th April.

194. **Cuculus poliocephalus poliocephalus** (Lath.). The Small Cuckoo.
A single female specimen was taken at Nagpur on 15th September 1913.

195. **Cuculus micropterus micropterus** (Gould). The Indian Cuckoo.
I have taken this bird at Nagpur in May, observed at Chanda (6th April) and at Beemalgondee, Chhindwara District (12th May).

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196. [**Hierococcyx sparverioides** (Vig.). The Large Hawk-Cuckoo.
Has been recorded as a straggler at Raipur.]

197. **Hierococcyx varius** (Vahl.). The Common Hawk-Cuckoo or Brain-fever Bird.
A common resident, depositing its eggs in the nests of Babblers.

198. **Cacomantis merulinus passerinus** (Vahl.). The Indian Plaintive Cuckoo.
Resident. The eggs have been taken from the nests of Franklin's Wren Warbler. Two males of *C. m. querulus* were obtained by Hume at Raipur in 1871.

199. [**Penthoceryx sonneratii sonneratii** (Lath.). The Banded Bay Cuckoo.
A rare species, recorded from Raipur.]

200. **Clamator jacobinus pica** Hempr. & Ehr. The Pied Crested Cuckoo.
Arrives with the breaking of the monsoons and after depositing eggs in the nests of Babblers disappears before the cold weather sets in.

201. **Eudynamis scolopaceus scolopaceus** (L.). The Indian Koel.
Lays from April to June from 1 to 3 eggs in the nests of crows and once in that of *Oriolus kundoo*.

202. **Rhopodytes viridirostris** (Jerd.). The Small Green-billed Malkoha.
Recorded from Sironcha.

203. **Taccocua leschenaulti sirkee** Gray. The Southern Sirkeer Cuckoo.
Resident.

204. **Centropus sinensis parroti** (Stres.). The Southern Crow-Pheasant.
Breeds June to August, making a huge globular nest of sticks, green leaves and grass in a thorny bush or tree.

205. **Psittacula eupatria nipalensis** (Hodg.). The Large Indian Paroquet.
Common in well-wooded localities. Breeds March to April in holes in trees.

206. **Psittacula krameri manillensis** Bechst. The Rose-ringed Paroquet.
Common. Breeds February to May. Some birds have the lower mandibles red.

207. **Psittacula cyanocephala cyanocephala** (L.). The Western Blossom-headed Paroquet.
Breeds February to May.

208. **Coracias benghalensis benghalensis** (L.). The Indian Roller.
Common. Breeds April to May, making use of a hole in a tree, or sometimes in an old wall or the roof of a house.

209. **Merops orientalis orientalis** (Lath.). The Common Indian Bee-Eater.
Common. Breeds April to May.

210. **Merops superciliosus javanicus** (Horsf.). The Blue-tailed Bee-Eater.
Resident, but not so common as the last species. Breeds in large colonies on river banks from April to May.

211. **Nyctiornis athertoni** (J. & S.). The Blue-bearded Bee-Eater.
Recorded at Pachmarhi by Osmaston.

212. **Ceryle rudis leucomelanura** (Reich.). The Indian Pied Kingfisher.
Breeds from February to May.

213. **(1035) Alcedo atthis taprobana** Klein. The Common Indian Kingfisher.
Breeds from February to June.

214. **Ramphalcyon capensis gurial** (Pearson). The Brown-headed Stork-billed Kingfisher.
Resident, but not common. Observed breeding in the Balaghat District in June and July.

215. **Halcyon smyrnensis fusca** (Bodd.). The Indian White-breasted Kingfisher.
Common resident. Breeds April to July.

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216. **Hydrocissa coronatus** Bodd. The Malabar Pied Hornbill.
Found in the eastern parts of the Provinces; I have observed it in the districts of Raipur, Nagpur, Bilaspur, Seoni and the Bastar State.

217. **Tockus birostris** (Scop.). The Common Grey Hornbill.
A common resident.

218. **Tockus griseus** (Lath.). The Malabar Grey Hornbill.
The species is reported as occurring in the Nimar District and I have noticed Hornbills at Khandwa which were destitute of a casque.

219. **Upupa epops epops** (L.). The European Hoopoe.
A winter visitor. One secured at Lamta in the Balaghat.

220. **Upupa epops saturata** Lönn. The Tibetan Hoopoe.
Ticehurst has identified birds from Seoni and the Deccan as of this race.

221. **[Upupa epops orientalis** (S. B.). The Indian Hoopoe.
Probably resident in the northern districts. Breeds from February to May in a hole in a tree, wall or bank.]

222. **Upupa epops ceylonensis** Reich. The Ceylon Hoopoe.
Birds from Seoni and Nagpur appear to be of this race.

223. **[Micropus melba melba** (L.). The Alpine Swift.
Recorded from Gwalgarh (McMaster).]

224. **Micropus affinis affinis** (Gray). The Common Indian Swift.
Common resident.

225. **Tachornis batassiensis palmarum** (Gray). The Palm-Swift.
Breeds from February to April and again in July.

226. **[Indicapus sylvaticus** (Tick). The White-rumped Spine-tail.
A forest species extending west to the Wyneganga and to Seoni.

227. **Hemiprocne coronata** (Tick.). The Indian Crested Swift.
Resident, keeping to wooded tracts.

228. **Caprimulgus monticolus** (Frank.). Franklin's Nightjar.
The commonest Nightjar in the Provinces. Breeds in May and June.

229. **Caprimulgus asiaticus** (Lath.). The Common Indian Nightjar.
Common in open country, groves and low jungle. Breeds in April and May.

230. **Caprimulgus macrurus albonotus** (Tick.). The Indian Long-tailed Nightjar.
A forest species, breeding from March to May in densely-shaded ravines.

231. **Caprimulgus indicus indicus** (Lath.). The Jungle Nightjar.
Resident in well-wooded tracts.

232. **Tyto alba stertens** Hartert. The Indian Barn-Owl.
Resident. Breeds from September to January, laying from 3 to 6 white eggs in a hole in buildings or trees.

233. **Tyto longimembris** Jerdon. The Grass Owl.
Resident in the eastern districts (Balaghat, Raipur).

234. **Asio flammeus flammeus** (Ponto). The Short-eared Owl.
A winter visitor.

235. **Strix ocellata** (Less.). The Mottled Wood-Owl.
Breeds from December to February.

236. **Ketupa zeylonensis hardwickii** Gray. The Brown Fish-Owl.
Resident.

237. **Bubo bubo bengalensis** (Frank.). The Indian Great-horned Owl.
Breeds from December to April, laying 2 to 4 white eggs on a rocky ledge or in a cave, or on the ground under a brush or tuft of grass.

238. **Bubo coramandus** (Lath.). The Dusky-Horned Owl.
Occurs in the well-watered parts of Raipur where it probably breeds.

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239. **Otus sunia sunia** (Hodg.). The North Indian Scops Owl.
A specimen taken at Nagpur on 2nd November.

240. **Scops bakkamoena marathi** Tice. The Collared Scops Owl.
Resident. Breeds from January to April.

241. **Athene brama indica** Frank. The Northern Indian Spotted Owlet.
Very common. Breeds February to April.

242. **Athene blewitti** (Hume). The Forest Spotted Owlet.
Found south of the Raipur District.

243. **Glaucidium radiatum radiatum** (Tick.). The Jungle Owlet.
A common resident in well-wooded localities. Breeds from March to May in holes in trees.

244. **Ninox scutulata lugubris** (Tick.). The Indian Brown Hawk-Owl.
Probably resident but not plentiful, has been taken both in open country and in forest at Nagpur and Chanda.

Order: Accipitres.

245. **Pandion haliaëtus haliaëtus** (Linn.). The Osprey.
A winter visitor.

246. **Aegypius monachus** (Linn.). The Cinereous Vulture.
A winter visitor to the Northern districts, has been observed in Jubbulpore, Saugor and Nimar.

247. **Sarcogyps calvus** (Scop.) The Black Vulture.
Resident. Breeds on trees from January to April.

248. **Gyps fulvus fulvescens** (Hume). The Indian Griffon Vulture.
Breeds on rocky cliffs in company with the next species and lays a single white egg. The latter have been taken in October and December.

249. **Gyps indicus indicus** (Scop.). The Indian Long-billed Vulture.
Common. Habits similar to above.

250. **Pseudogyps bengalaensis** (Gmel.). The Indian White-backed Vulture.
Resident. Breeds in October and November. The nest is an irregular platform placed on a tree.

251. **Neophron percnopterus ginginianus** (Lath.). The Smaller White Scavenger Vulture.
Very common resident. Breeds February to May, making a nest of sticks on a cliff, tree or building.

252. [**Aquila heliaca** (Sav.). The Imperial Eagle.
Probably a rare winter visitor.]

253. **Aquila nipalensis nipalensis** (Hodg.). The Eastern Steppe Eagle.
A winter visitor ranging south to Raipur and Nagpur where I have taken it.

254. **Aquila rapax vindhiana** (Frank.). The Indian Tawny Eagle.
A common resident. Breeds from November to June, building a nest of sticks on trees.

255. [**Aquila clanga** (Pall.). The Greater Spotted Eagle.
Probably resident, in the Northern districts. Breeds on trees from April to June and as far south as the Tapti.]

256. **Aquila hastata** (Less.). The Small Indian Spotted Eagle.
Resident in the Eastern districts. Has been observed breeding in Raipur and Bilaspur.

257. **Hieraëtus fasciatus fasciatus** Vieill. Bonellis Eagle.
Resident but not common. Breeds December to February.

258. **Hieraëtus pennatus** Gmel. The Indian Booted Eagle.
Specimens obtained at Hoshangabad and Nagpur.

259. **Butastur teesa** (Frank.). The White-eyed Buzzard.
A common resident. Breeds in April.

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260. **Haliaëtus leucorypha** (Pall.). Pallas' Fishing Eagle.
Resident. Breeds in November.

261. [**Ichthyophaga ichthyaëtus** (Horsf.). The Large Grey-headed Fishing Eagle.
Resident. MacArthur took an egg at Ramtek on 20th November.]

262. **Ichthyophaga humilis plumbeus** (Jerd.). The Himalayan Fishing-Eagle.
Specimens of this Fishing Eagle have been taken by Mr. A. Donald in the Melghat.

263. **Haliastur indus indus** (Bodd.). The Brahminy Kite.
Resident. Breeds in February.

264. [**Ictinaetus malayensis perniger** (Hodg.). The Indian Black Eagle.
Jerdon is said to have seen this species in Central India (? Bastar) and MacArthur declares he took an egg probably of this species in April in the Bilaspur District.]

265. **Limnaëtops cirrhatus cirrhatus** (Gmel.). The Indian Hawk Eagle.
Resident. The nest is placed on a high tree, in which a single egg is laid at some time from January to April.

266. [**Limnaetops nepalensis nepalensis** (Hodg.). Hodgson's Hawk-Eagle.
Reported to have been found in winter as far south as Seoni and Pachmarhi, but these may just as well have been *L. n. kelaarti*, Legge's Hawk Eagle.]

267. **Circaëtus gallicus** (Gmel.). The Short-toed Eagle.
Resident. Breeds on trees (rarely on cliffs), and lays a single egg between January and May in a loosely constructed nest of sticks.

268. **Haematornis cheela minor** (Hume). The Indian Lesser Crested Serpent Eagle.
Breeds on trees from March to May.

269. **Milvus migrans govinda** (Sykes). The Common Pariah Kite.
Breeds from October to February.

270. **Milvus migrans lineatus** (Gray). The Black-eared Kite.
A winter visitor.

271. **Elanus caeruleus vociferus** (Lath.). The Black-winged Kite.
Breeds in December and January.

272. **Circus macrourus** (Gmel.). The Pale Harrier.
A common winter visitor.

273. **Circus pygargus** (Linn.). Montagu's Harrier.
A winter visitor.

274. [**Circus cyaneus** (Linn.). The Hen Harrier.
A straggler to the Provinces in winter.]

275. **Circus melanoleucus** (Forst.). The Pied Harrier.
A winter visitor to the Eastern districts. I have observed it at Paraswara in the Balaghat District, and at Nawegaon, Bhandara District.

276. **Circus aeruginosus aeruginosus** (L.). The Marsh Harrier.
A common winter visitor. I once observed one feeding on carrion and keeping at bay a crowd of vultures.

277. [**Buteo rufinus** (Cret.). The Long-legged Buzzard.
A rare winter visitor. Has been taken at Raipur.]

278. **Astur badius dussumieri** (Temm.). The Shikra.
Common resident. Breeds April to May.

279. **Astur trivirgatus indicus** Pearson. The Crested Goshawk.
A rare forest bird, probably resident. I have taken it at Nagpur and in the Balaghat District.

280. **Accipiter nisus nisosimilis** (Tick.). The Asiatic Sparrow-Hawk.
A winter visitor. Has been taken at Khatkali in the Melghat and at Nagpur.

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281. **Pernis ptilorhynchus ruficollis** (Less.). The Indian Crested Honey-Buzzard.
Resident. Breeds April to July.

282. **Falco peregrinus calidus** (Lath.). The Eastern Peregrine Falcon.
Taken on the banks of the Nerbudda in winter.

283. **Falco peregrinus peregrinator** (Sund.). The Indian Peregrine or Shahin Falcon. Resident but not common. The nest is a mass of sticks, placed on a cliff.

284. [**Falco peregrinus babylonicus** (Gur.). The Red-capped or Barbary Falcon.
A rare winter visitor. A specimen has been taken at Raipur.]

285. **Falco jugger** (Gray). The Lagger Falcon.
Resident.

286. **Falco subbuteo subbuteo** (L.). The Hobby.
A winter visitor. I took a specimen at Nagpur, and it has been taken at Raipur.

287. **Falco chiquera chiquera** (Daud.). The Red-headed Merlin.
Resident. Breeds January to May, generally about February.

288. **Falco tinnunculus objurgatus** S.B. The Indian Kestrel.
The Kestrels have not yet been worked out for want of material, two races are probably winter visitors, and a third is resident. A clutch of three has been taken in the Saugor District on 30th September.

Order: Columbae.

289. [**Crocopus phoenicopterus phoenicopterus** (Lath.). The Bengal Green Pigeon.
Recorded as occurring with the next species at Pachmarhi.]

290. **Crocopus phoenicopterus chlorogaster** (Blyth). The Southern Green Pigeon.
Resident.

291. **Sphenocercus sphenura** (Vig.). The Wedge-tailed Green Pigeon or Kokla.
Osmaston records this species as a very rare visitor to Pachmarhi in April.

292. **Muscadivora aenea sylvatica** (Tick.). The Northern Green Imperial Pigeon.
Occurs in the Bastar State, and Chanda with a wing measurement of 220 to 225 mm.

293. **Chalcophaps indica** (L.). The Emerald Dove.
Resident in forest country in the Balaghat District.

294. **Columba livia intermedia** (Strick.). The Indian Blue Rock-Pigeon.
Resident, but more plentiful in the wheat-growing areas; scarce in the cotton-growing tracts except near the vicinity of cliffs or old forts where large colonies usually establish themselves.

295. **Streptopelia orientalis ferrago** Evers. The Indian Turtle Dove.
A winter visitor.

296. **Streptopelia orientalis meena** (Sykes). The Indian Rufous Turtle Dove.
Resident. I have taken it in June at Nagpur and in January at Paraswara (Balaghat District).

297. **Streptopelia chinensis suratensis** (Gm.). The Spotted Dove.
Resident, partial to forest areas. Breeds almost throughout the year.

298. **Streptopelia senegalensis cambayensis** (Gm.). The Little Brown Dove.
Resident. Breeds almost throughout the year.

299. **Streptopelia decaocto decaocto** (Friv.). The Indian Ring-Dove.
Resident. Breeds throughout the year.

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300. **Oenopopelia tranquebarica** (Herm.). The Indian Red Turtle-Dove.
Resident. Breeds almost throughout the year.

ORDER: PTEROCLETES.

301. **Pterocles indicus** (Gmel.). The Painted Sandgrouse.
Resident. Breeds chiefly in March, April and May.

302. **Pterocles exustus erlangeri** (Neum.). The Common Indian Sandgrouse.
Resident.

ORDER: GALLINAE.

303. **Pavo cristatus** (L.). The Common Peafowl.
Breeds June to September. Albino peafowl have been reported from the Bastar State.

304. **Gallus bankiva** R. & K. The Indian Jungle-Fowl.
Resident in the eastern half of the Provinces, Balaghat, Bhandara, Bastar, etc., extending west into the Chanda District, and across the Pench River.

305. **Gallus sonneratii** (Temm.). The Grey Jungle-Fowl.
Resident throughout the Nerbudda Valley west of Jubbulpore, the Melghat, and the Chanda District.

306. **Galloperdix spadicea spadicea** (Gmel.). The Red Spur-Fowl.
Resident. Birds from the Nimar District appear to be *G. s. caurina*, Bf.

307. **Galloperdix lunulata** (Val.). The Painted Spur-Fowl.
Resident.

308. **Excalfactoria chinensis** (L.). The Blue-throated Quail.
Probably resident in the eastern parts of the Provinces.

309. **Coturnix coturnix coturnix** (L.). The Common Quail.
A winter visitor rarely breeding in the Provinces.

310. **Coturnix coromandelica** (Gmel.). The Black-breasted or Rain-Quail.
Resident.

311. **Perdicula asiatica asiatica** (Lath.). The Jungle Bush-Quail.
Resident. Breeds September to February.

312. **Perdicula asiatica argoondah** (Sykes). The Rock Bush-Quail.
Resident in the Western Central Provinces.

313. **Coryptoplectron erythrorhynchum blewitti** (Hume). Blewitt's Bush-Quail.
Resident in the forest regions of the Eastern Central Provinces (Mandla, Balaghat, Seoni, Chanda, Raipur and Bastar).

314. [**Francolinus francolinus asiae** (Bonap.). The Indian Black Partridge.
May be resident in the extreme north of the Provinces. ?]

315. **Francolinus pictus pictus** (J. & S.). The Southern Painted Partridge.
Resident in the southern parts of the Provinces (Raipur, Chanda and Balaghat). Breeds during the rains.

316. **Francolinus pictus pallidus** (Grey). The Northern Painted Partridge.
Resident in the Northern and Western portions of the Provinces. The races of the Painted Partridges in the Central Provinces have not yet been properly investigated.

317. **Francolinus pondicerianus interpositus** (Hart.). The Northern Grey Partridge.
Breeds February to June and sometimes again from September to November.

ORDER: HEMIPODII.

318. **Turnix suscitator taijoor** (Sykes). The Common Bustard Quail.
Breeds chiefly during the rains (June).

319. **Turnix dussumieri** (Temm.). The Little Button-Quail.
Resident. Breeds chiefly from June to September.

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320. **Turnix maculatus tanki** (Blyth). The Indian Button-Quail.
Resident. Breeds May to September.

ORDER: GRALLAE.

321. [**Rallus aquaticus korejewi** Sar. The Turkestan Water Rail.
A straggler in winter. Has been taken at Sehore.]

322. [**Hypotaenida striata gularis** Horsf. The Indian Blue-Breasted Banded Rail.]

323. [**Porzana porzana** L. The Spotted Crake.
May be a straggler in winter.]

324. **Porzana pusilla pusilla** (Pallas). The Easten Baillons Crake.
Taken at Nagpur in April and May and observed elsewhere in winter.

325. **Amaurornis phoenicurus chinensis** (Bodd.). The Chinese White-Breasted Water Hen.
Breeds probably from May to September; clutches of 4 and 5 taken in Bhandara in July. A bird from Nagpur had a wing measurement of 156 mm.

326. **Amaurornis akool akool** (Sykes). The Brown Crake.
Resident.

327. **Gallinula chloropus indicus** (Blyth). The Indian Moorhen.
Breeds from July to September.

328. **Porphyrio poliocephalus poliocephalus** (Lath.). The Indian Purple Coot.
Breeds in September.

329. **Fulica atra atra** (L.). The Coot.
Breeds in September in a nest very similar to that of the Purple Coot.

330. **Metopidius indicus** (Lath.). The Bronze-winged Jacana.
Breeds from June to September.

331. **Hydrophasianus chirurgus** (Scop.). The Pheasant-tailed Jacana.
Nidification similar to that of the Bronze-winged Jacana.

332. **Rostratula benghalensis benghalensis** (L.). The Painted Snipe.
Resident. Breeds at all seasons.

333. **Grus grus lilfordi** (Sharpe). The Eastern Crane.
A winter visitor to the Nerbudda Valley.

334. **Grus leucogeranus** (Pallas). The Great White or Siberian Crane.
A straggler was shot by McMaster at Kuhi near Nagpur.

335. **Antigone antigone antigone** (L.). The Sarus.
Resident. Breeds in July and August and also in March.

336. **Anthropoides virgo** (L.). The Demoiselle Crane.
A winter visitor keeping to the larger river basins.

337. **Choriotes nigriceps,** Vig. The Great Indian Bustard.
Resident. Breeds October to December, laying a single egg, in a hollow on the ground with or without a lining of grass. Females sometimes have the black pectoral band complete and distinct.

338. **Sypheotides indica** (Gmel.). The Lesser Florican or Likh.
Breeds in August and September.

ORDER: CHARADRIFORMES.

339. **Burhinus oedicnemus indicus** (Salv.). The Indian Stone-Curlew.
Breeds from February to August, but chiefly in April.

340. **Esacus recurvirostris** (Cuv.). The Great Stone-Plover.
Resident. Lays two eggs between February and June in river-beds on the sand or amongst stones.

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341. **Cursorius coromandelicus** (Gmel.). The Indian Courser.
Breeds from March to July.

342. **Rhinoptilus bitorquatus** (Jerd.). Jerdon's Courser.
A rare bird found at Sironcha.

343. **Glareola maldivarum** (Forst.). The Large Indian Swallow-Plover.
Resident. Breeds in May.

344. **Glareola lactea** (Temm.). The Small Indian Pratincole.
Breeds in company with Terns, on sandbanks in the larger rivers from March to May.

345. **Larus brunnicephalus** (Jerd.). The Brown-headed Gull.
A specimen was shot on the Telinkeri Tank, Nagpur, on 17th June.

346. **Larus argentatus cachinnans** Pallas. Yellow-legged Herring-Gull.
Taken on the Mahanaddy River at Chandrapur in November.

347. [**Chlidonias leucopareia indica.** The Indian Whiskered Tern.
A winter visitor.]

348. **Chlidonias l. leucoptera.** White-winged Black Tern.
Has been taken at Raipur.

349. **Gelochelidon nilotica nilotica.** The Gull-billed Tern.
Observed on the Mahanaddy River.

350. **Sterna seena** (Sykes). The Indian River Tern.
Breeds gregariously in March, April or May in a depression on a sandbank.

351. **Sterna melanogaster** (Temm.). The Black-bellied Tern.
Nidification similar to that of *S. seena* and frequently breeding in company with it.

352. **Rhynchops albicollis** (Swains.). The Indian Skimmer.
Resident on the Nerbudda and Mahanaddy Rivers. Breeds from March to April after the fashion of other terns and in company with them.

353. [**Charadrius dubius curonicus** Gmel. The European Little Ringed Plover.
A winter visitor.]

354. **Charadrius dubius jerdoni** (Legge). Jerdon's Little Ringed-Plover.
Breeds from February to March, but probably later and earlier as well.

355. **Pluvialis dominicus fulvus** Gmel. The Eastern Golden Plover.
Taken on the Mahanaddy River, near Chandrapur.

356. **Hoplopterus duvaucelli** Lesson. The Spur-winged-Plover.
Observed in the Nerbudda and Indravati Rivers. Breeds from March to May.

357. **Lobivanellus indicus indicus** (Bodd.). The Indian Red-wattled Lapwing.
Breeds chiefly from April to June, laying 4 eggs in a small hollow.

358. **Lobipluvia malabarica** (Bodd.). The Yellow-wattled Lapwing.
Breeds from May to July.

359. **Himantopus himantopus himantopus** L. The Back-winged Stilt.

360. **Numenius arquata arquata** Lin. The Western Curlew.
All curlews which I have shot on the Mahanaddy River have proved to be of this race. They were generally in small flocks.

361. **Numenius arquata orientalis** Brehm. The Eastern Curlew.
A winter visitor. All birds shot on inland tanks in the Bhandara and Nagpur districts were of this race. They were either solitary or in small flocks of 4 or 5 birds.

362. **Limosa limosa limosa.** The Black-tailed Godwit.
A rare winter visitor, one shot on the Sonagaon tank 4 miles south of Nagpur. It was a solitary bird associating with one other wader.

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363. [**Macroramphus semipalmatus** (Jerd.). The Snipe-billed Godwit.
A specimen is said to have been killed at Raipur by Capt. S. L. Wood (Asian 22 February 1894, page 377).]

364. **Tringa ochropus** (L.). The Green Sandpiper.
A very common winter visitor. It has been observed at Nagpur on the 14th September and some birds remain till June.

365. **Tringa stagnatilis** (Becks.). The Marsh Sandpiper.
A winter visitor to the Northern districts (Jubbulpore, Seoni, etc.).

366. **Tringa hypoleuca** (L.). The Common Sandpiper.
A winter visitor.

367. **Tringa glareola** (L.). The Wood Sandpiper.
Very common winter visitor.

368. **Tringa totanus** (L.). The Redshank.
Observed on the Mahanaddy River.

369. **Glottis nebularia** (Gunner). The Greenshank.
A winter visitor.

370. **Philomachus pugnax** (L.). The Ruff and Reeve.
A winter visitor, solitary individuals as well as large flocks have been seen.

371. **Erolia minuta** (Leister). The Little Stint.
A winter visitor, common on the Nerbudda.

372. **Erolia temminckii** (Leister). Temminck's Stint.
A winter visitor.

373. [**Erolia alpina alpina**, Lin. The Eastern Dunlin.
A straggler to the Province in winter.]

374. **Capella nemoricola** (Hodg.). The Wood Snipe.
Occurs on migration, has been taken at Mandla, Pachmarhi, Amarkantak, Balaghat and Serguja.

375. **Capella gallinago gallinago** (L.). The Common Fantail Snipe.
A winter visitor.

376. **Capella stenura** (Bonap.). The Pintail Snipe.
A winter visitor, more plentiful than the last species.

377. **Lymnocryptes minima** (Brunn.). The Jack Snipe.
A winter visitor.

ORDER: STEGANOPODES.

378. Pelicans have been observed in the Northern districts in the rains and also in the Eastern districts, but whether they are *P. onocrotalus* or *P. philippensis* or both, has not been ascertained.

379. **Phalacrocorax carbo sinensis** (S. & N.). The Indian Large Cormorant.
Resident, but not plentiful, nests on trees growing in water. An incomplete clutch of 2 eggs was taken on the 13th July in the Balaghat District.

380. [**Phalacrocorax fuscicollis** (Steph.). The Indian Shag.
A rare bird if it occurs at all.]

381. **Phalacrocorax niger** Vieill. The Little Cormorant.
Resident. Breeds in colonies in July.

382. **Anhinga melanogaster** (Penn.). The Indian Darter or Snake-bird.
Breeds in colonies, and generally in company with Cormorants and Herons, on trees in or near water.

ORDER: HERODIONES.

383. **Platalea leucorodia major** (Temm.). The Indian Spoonbill.
Observed in the northern and eastern districts.

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384. **Threskiornis melanocephalus** (Lath.). The White Ibis.
Resident. Breeds gregariously from June to August constructing a stick nest on a large tree.

385. **Pseudibis papillosus** (Temm.). The Indian Black Ibis.
Resident. Breeds at various seasons, March and April and again from August to December.

386. **Plegadis falcinellus falcinellus** The Glossy Ibis.
Taken on the Mahanaddy, the birds were in a very large flock.

387. **Dissoura episcopa episcopa** (Bodd.). The Indian White-necked Stork.
A common resident. Breeds from June to August.

388. **Xenorhynchus asiaticus asiaticus** (Lath.). The Black-necked Stork.
Resident, breeds from October to December.

389. **Leptoptilus javanicus** (Horsf.). The Smaller Adjutant.
Most probably resident.

390. **Pseudotantalus leucocephalus leucocephalus** (Penn.). The Painted Stork.
Breeds gregariously often on trees growing near villages and makes a small nest of sticks.

391. **Anastomus oscitans** (Bodd.). The Open-bill.
Breeds gregariously from April to July.

392. **Ardea purpurea manillensis** (Meyen.). The Eastern Purple Heron.
Breeds from April to August, making a huge stick nest in thickets or in dense clumps of bulrushes.

393. **Ardea cinerea rectirostris** Gould. The Eastern Grey Heron.
Resident.

394. [**Ardea goliath** Gret. The Giant Heron.
Casual, Blanford once saw them near Nagpur (Kuhi).]

395. **Egretta alba modesta** (Gray). The Eastern Large Egret.
All the Egrets are resident and breed gregariously in July on trees, making nests of sticks.

396. **Egretta intermedia intermedia** (Wagler). The Smaller Egret.

397. **Egretta garzetta garzetta** (Linn.). The Little Egret.

398. **Bubulcus ibis coromandus** (Bodd.). The Cattle Egret.
Breeds from June to August.

399. **Demiegretta asha** (Sykes). The Indian Reef-Heron.
A specimen was observed on the Telinkheri Tank, Nagpur, and another on the Mahanaddy.

400. **Ardeola gravii** (Sykes). The Indian Pond Heron.
Breeds in July and August, making a stick nest on a tree, several pairs often nesting in company.

401. **Butorides striatus javanicus** (Horsf.). The Indian Little Green Heron.
Breeds May to August.

402. **Nycticorax nycticorax nycticorax** (Linn.). The Night Heron.
Breeds July to September in company with Egrets and other Herons.

403. **Ixobrychus cinnamomeus** (Gmel.). The Chestnut Bittern.
Resident. Three eggs were taken from a nest placed amongst reeds in the Bhandara District in September. A specimen was also secured at Nagpur in April.

404. [**Dupetro flavicollis flavicollis** (Lath.). The Black Bittern.
Reported to be resident.]

405. **Botaurus stellaris stellaris** (Linn.). The Bittern.
A winter visitor.

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ORDER: PHOENICOPTERI.

406. **Phoenicopterus ruber antiquorum** (Temm.). The Common Flamingo.
Flocks of flamingoes are now and then seen flying over or settling in the Nagpur tanks. On the 9th June 1912 a large flock was observed on the Ambajheri Tank and on the 27th June 1912 I obtained a specimen out of a flock on the Gorewara Tank.

407. **Phoeniconaias minor** (Geoffr.). The Lesser Flamingo.
A specimen was shot on the 9th June 1912, associating with a flock of the larger species. In the winter of the same year I also saw a quantity of these birds being hawked about for sale.

ORDER: ANSERES.

408. **Sarkidiornis melanotus** (Penn.). The Nukhta or Comb-Duck.
Resident. Breeds on trees, placing the nest in a hole in the stem or in a depression between the larger branches.

409. **Asarcornis scutulatus** (Muller). The White-winged Wood Duck.
A specimen is said to have been shot in the Bilaspur District by Mr. E. H. Young (*J.B.N.H.S.*, vol. xii, p. 572).

410. **Nettopus coromandelianus** (Gmel.). The Cotton Teal.
Breeds in July and August in holes in trees.

411. [**Anser anser** (Linn.). The Grey Lag Goose.
Winter visitor to the Nerbudda.]

412. **Anser indicus** (Lath.). The Bar-headed Goose.
A winter visitor, very common on the Nerbudda. A solitary individual was shot in a tank at Naghbir in the Chanda District.

413. **Dendrocygna javanica** (Horsf.). The Whistling Teal.
Resident; makes a nest of sticks in a tree, occupies an old nest of a crow or heron, or builds in grass or thorny shrub near water.

414. [**Dendrocygna fulva.** The Large Whistling Teal.
Oates in Humes' *Nests and Eggs* records a nest found at Saugor, taken from a large hollow in a tree.]

415. **Casarca ferruginea** (Pall.). The Ruddy Sheldrake or Brahminy Duck.
A winter visitor, keeping to the wider streams and rivers.

416. **Anas platyrhyncha platyrhyncha** (Linn.). The Mallard.
An occasional winter visitor to the northern district.

417. **Anas poecilorhyncha poecilorhyncha** (Fors.). The Indian Spotbill.
Resident, breeds July to September.

418. **Chaulelasmus streperus** (Linn.). The Gadwall.
A winter visitor.

419. [**Mareca penelope** (Linn.). The Widgeon.
Probably an irregular winter visitor.]

420. **Nettion creca creca** (Linn.). The Common Teal.
A winter visitor.

421. **Dafila acuta** (Linn.). The Pintail.
A winter visitor.

422. **Querquedula querquedula** (Linn.). The Garganey or Blue-winged Teal.
A winter visitor, staying with us till about the middle of April. It is one of the common ducks of the Provinces.

423. **Spatula clypeata** (Linn.). The Shoveller.
A winter visitor.

424. [**Marmaronetta angustirostris,** Mene. The Marbled Teal.
Occasionally wanders into the Provinces.]

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425. **Netta rufina** (Pallas). The Red-crested Pochard.
A winter visitor.

426. **Nyroca ferina ferina** (Linn.). The Pochard or Dun-bird.
A winter visitor.

427. **Nyroca rufa rufa** (Linn.). The White-eyed Duck.
A winter visitor and perhaps the commonest Duck.

428. **Nyroca fuligula** (Linn.). The Tufted Duck.
A winter visitor.

429. **Merganser merganser orientalis** (Gould). The Eastern Goosander.
A winter visitor, has been shot at Arang on the Mahanaddy in the Raipur District. The Smew (*Mergus albellus*) is probably also found on the Nerbudda.

Order: Pygopodes.

430. **Podiceps ruficollis capensis** Salo. The Indian Little Grebe or Dabchick.
A common resident. The breeding season is from July to September.

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Strobilanthes Kunthianus T. And. in flower on a hillside in the Pulneys, 1934.

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THE FLOWERING OF *STROBILANTHES* IN 1934.

BY

M. E. Robinson.

(*With eight plates*).

This paper makes no pretensions to be a scientific study of the interesting genus *Strobilanthes*, but is merely a short account of a few of the species that flowered on the hills of South India, during the year 1934.

The genus was exhaustively studied by Robert Wight and Col. Beddome, who did so much for Indian Botany during the latter half of the nineteenth century, and each described over twenty species, making illustrations of forty species in their *Icones Plantarum*. Gamble describes fortysix species in the Flora of the Madras Presidency, and Fyson has also given descriptions and illustrations of several of the more common species in his 'Flora of the Nilgiri and Pulney Hill tops'. As these works of reference may not be readily available to the general reader, a photograph and drawings are given here to illustrate the species mentioned.

The best known of the Strobilanthes is *Strobilanthes Kunthianus* which flowers in greater profusion than any other species; so much so indeed, as to earn for itself the name of the 'great blue flower of the Nilgiris', and to colour whole tracts of country with sheets of its delicate blue. But not every year. In fact only once in twelve years is this remarkable sight to be seen; and though in the intervening years occasional plants can be found here and there in flower, and in some years quite a number may be found, the full gregarious flowering, when whole hillsides are covered with the plants, every one bearing great bunches of mauve-blue flowers, takes place only at intervals of twelve years. The year 1934 has seen such a flowering. Its last appearance was in 1922, and before that in 1910. Records of its appearance in 1898 and 1886 have been made by various observers and Mr. Cockburn of Kotagiri, in the Nilgiris, has given me a remarkable record of its flowerings during a hundred years. His grandfather was one of the first European settlers on the Nilgiris in 1826, and his aunt first saw Strobilanthes in flower in 1838 when she was a child of nine; and saw and recorded Strobilanthes in full flower in 1850, 1862, 1874, 1886, 1898, 1910 and 1922.

This seems to establish the twelve year period fairly well, though other dates have been given for its appearance such as 1848, 1908, 1925, 1932, which suggest a more irregular period. Gamble indeed says 'probably about six years' and Fyson says 'irregular intervals from seven to twelve years'. Some specimens were sent me from the Nilgiris purporting to be of an 'eight

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year variety' but these were *S. Kunthianus* exactly the same as the twelve year plant. From the information I have gathered and the above mentioned record, I should think it probable that a full flowering takes place only once in twelve years, with lesser outbursts of flowering in scattered areas at other times. The year 1934 has undoubtedly been a year of full flowering on all the hills. There were acres of blue flowers on the Pulney Hills from the beginning of July until December, when there were still isolated patches in the more sheltered valleys round Poombarai, though the open hillsides were covered with the dead and blackening bushes. On the Nilgiris it did not appear in full flower until August, and in October a hillside above Wellington was blue, and much could still be found round Pykara and Kotagiri. On the Anamalais it appeared only in October and covered the grass hills there with sheets of bloom.

The plant varies very much in size according to its habitat. On the open hills and grass lands it is short and close, being often only one to two feet high; whereas at the sides of the roads, and in the sholas it grows into strong bushes eight to ten feet in height. The flowers vary in colour also from a very pale lilac blue, almost white, to a deep purplish blue.

It is noted by all who have seen two or three flowerings, that at each successive period, the area over which it appears becomes less and less. Every year more land in these hills is taken up and cleared for tea estates, or for fruit and vegetable culture, or for building. Many a hillside that was once blue with Strobilanthes, is now green with the little flat topped tea bushes, and Strobilanthes is ruthlessly exterminated as a pest. It must have been a wonderful sight when first seen by a European, when there were no estates, and no habitations other than the scattered hill villages, and one can only regret the loss of so much beauty. It is easy to understand the awe and veneration with which the simple hill people would look upon this marvellous flower, appearing at such long intervals, and there are to this day old people among the Todas, Badagas and Kotas, who refer to the number of times they have seen 'the great blue flower' in chronicling the chief events of their lives.

One interesting result of the gregarious flowering of Strobilanthes is the large increase in the number of bees found in its vicinity during its flowering period. Each flower secretes honey in a small disc below the ovary, so that immense quantities of honey must be available, and two different kinds of honey bees visit the flowers. The large dark tipped rock bee (*Apis dorsata*) and the dark hill variety of the common Indian honey bee (*Apis indica*) are both visitors to Strobilanthes, and their curious hanging hives are very conspicuous. In 1922 as many as 28 were found hanging from one Eucalyptus tree near Kodaikanal, and 32 were counted on an overhanging rock; while 7 swarms took place on the verandah of a college building at Shembaganur.

This large production of honey tempts the hill bears to come in search of their favourite food, and round Kotagiri, in the Nilgiris, a considerably larger number of them were seen in 1934.

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The honey is said to have a peculiar flavour when Strobilanthes is in flower, being rather more bitter than usual.

The genus *Strobilanthes* belongs to the natural order *Acanthaceae*. The chief characteristics of the genus are as follows:—

(1) A gamopetalous bell-shaped corolla which narrows gradually towards the base in some species, as *S. Kunthianus* while in some others the bell passes suddenly into a narrow tube as in *S. foliosus*.

(2) The inflorescence is a spike, the flowers being enclosed in overlapping bracts; the spike is elongated in some species as *S. Kunthianus* and *S. consanguineus*; in others short and close or capitate as in *S. foliosus* and *S. Wightianus*. The overlapping bracts are supposed to give the inflorescence somewhat the appearance of a pine cone from which the genus takes its name, *strobile* being the Greek word for pine cone.

(3) There are either two or four stamens, sometimes two fertile and two infertile.

(4) The long style ends in a bilobed stigma with unequal lobes.

(5) The superior ovary is seated on a honey secreting cushion or disc.

(6) The leaves are opposite, simple and usually dentate with conspicuous veins.

(7) Many of the species are very hairy, as *S. Wightianus; S. Perrottetianus* with red hairs; *S. urceolaris*, sticky with an aromatic scent; *S. Lawsoni* long silky hairs, densely covering the plant.

(8) With few exceptions, nearly all the species flower only at intervals of a number of years. In most species the period is not definitely established.

The following eight species were found flowering on the Nilgiris and Pulneys during 1934.

(A) *Flowers having two stamens*:—

(1) *Strobilanthes Kunthianus* T. And: (Pls. I and II). Found on the Nilgiris, Pulneys, Anamalais, High Range, Shevaroys, Billigirirangans; period 12 years; a woody shrub found in the open and in sholas, varying with locality from 1½ to 10 ft. in height.

Smooth reddish stem, bearing opposite leaves almost white below with soft short hairs between the veins. There are two types of leaves, the more common longer than broad, with pointed tip; less common shorter, as broad as long, and a broad rounded tip. The edge is toothed and the veins conspicuous 8-10 pairs; inflorescence rather long spike; bracts slightly hairy.

Corolla pale to deep mauve blue, bell narrowing gradually to the base.

(2) *Strobilanthes foliosus* T. And: (Pl. III). Found on Nilgiris and Pulneys and reported from other hill ranges; at edges of sholas only; quite common and said to flower every year; shrub 10 or 12 ft. high.

Smooth grey-brown stem; leaves opposite quite smooth; broad with pointed tip; toothed edge.

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Inflorescence short and compact, supported by four outer leaves with large bases surrounding the spike. Outer bracts also somewhat leafy, quite smooth.

Corolla pale blue, with a long narrow tube as long as the bell; stamens two long and two very small infertile ones at the base of the long ones.

(3) *Strobilanthes consanguineus* C. B. Clarke: (Pl. IV). Found on the Pulneys at about 5,000 ft. and below to 3,500 ft.; abundant at the edges of sholas and the road; Gamble says its period is about 12 years, it having been previously recorded in flower in 1909, 1897 and 1884.

Shrub 10 or 12 ft. high glabrous, except the inflorescence which is sticky; leaves rather large, long-stalked and with a long point; toothed edge.

Inflorescence very long and slender spike, often three or more together; bracts with sticky hairs; flowers rather small, very pale lilac, short tube below the bell.

(4) *Strobilanthes Lawsoni* Gamble: (Pl. V). Found on the Nilgiris and previously collected in 1917 and 1883; so its period may be about 17 years; cultivated in a few gardens on the Nilgiris for the sake of its foliage; the whole plant densely covered with long white silky hairs.

Inflorescence a long spike; corolla pale blue with a rather short tube; stamens with white silky hairs.

(B) *Flowers having four stamens*:—

(5) *Strobilanthes Zenkerianus* T. And: (Pl. III). Found on the Nilgiris and Pulneys; a shrub so like *S. foliosus* that it is difficult to distinguish them at first sight; leaves perhaps smaller, darker green and of tougher consistency.

Inflorescence a short compact head; similar to that of *S. foliosus* but the outer leaves surrounding the head are wanting, and these are true bracts, very leafy.

Flower similar in blue colour and long tube below the bell; stamens four fertile, two long and two short; the distinguishing characteristic between this species and *S. foliosus*. In dried specimens it is often difficult to tell whether the two small stamens are fertile or infertile.

(6) *Strobilanthes Wightianus* Nees: (Pl. VI). Found on the Nilgiris, very abundant in 1934 but said to flower every year; easily recognised; very roughly hairy shrub 6 to 8 ft. high at the edges of sholas; short and compact, often only one foot high on the open roadsides; leaves rather short and broad; short stalks and very hairy.

Inflorescence short compact head, bracts leafy and very hairy.

Corolla large pale blue with dark blue lines and the tube and throat brown, showing up the four yellow stamens all of the same length; very short tube below the bell.

(7) *Strobilanthes Perrottetianus* Nees: (Pl. VII). This was found on the Nilgiris and has been reported from the Anamalais, and was found in 1852 and in 1883 and more lately in 1908 and 1918. Its period may be about ten years but seems irregular,

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Strobilanthes Kunthianus T. And.

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Strobilanthes foliosus T. And. or *S. Zenkerianus* T. And.

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Strobilanthes consanguineus C. B. Clarke.

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Strobilanthes Lawsoni Gamble.

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Strobilanthes Wightianus Nees.

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Strobilanthes Perrottetianus Nees.

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Strobilanthes urceolaris Gamble.

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This grows on the edges of sholas and is also an easily recognised species, being covered on all the younger parts, bracts, leaves and stem with soft dark red hairs. The stems are swollen at the joints. Leaves rather large.

Inflorescence about an inch to two inches long, rather stout, and very conspicuous in the shola by reason of the bracts being rose red; they fade to reddish green as they get older; flower pale lilac, with very short tube; stamens joined in a sheath for lower half, two inner ones slightly shorter.

(8) *Strobilanthes urceolaris* Gamble: (Pl. VIII). This flowered in November and December on the Pulneys very abundantly by the roadside at about 6,000 ft. and is reported also from the Nilgiris but no dates for its appearance are given by Gamble. A strong aromatic scent was noticed where the shrubs were abundant, the plant being covered with short viscid hairs. Stem slightly swollen at the joints, and reddish.

The inflorescence is short and compact, surrounded by two leafy bracts, and often grows in threes. The corolla pale blue, tube shorter than the bell.

Stamens joined in a sheath at base, two inner shorter than two outer.

News of the flowering of several other species in different localities, chiefly at somewhat lower levels, and in the sholas, has reached me, but as no specimens have been procurable, I am unable to say what species they are. It seems that 1934 has been a good year for the flowering of Strobilanthes.

I should like to express here my grateful thanks to the various friends and correspondents who have helped me by sending me specimens or in identifying them for me. Particularly I should mention Mr. Charles Brown of Coonoor; Mr. Cockburn of Kotagiri; the Rev. Father Münch, S.J., of Shembaganur; Mr. J. Williams of the Anamalais; Mr. R. Morris of the Billigirirangans; Mr. P. V. Mayuranathan, B.A., Government Botanist at the Madras Museum and Dr. T. V. Ramakrishna Iyer, B.A., the Government Entomologist at Coimbatore, to all of whom I am indebted for kind help.

EXPLANATION OF PLATES.

(2) *Strobilanthes Kunthianus* T. And.

A.—Enlarged drawing of flower: (*a*) Stamens; (*b*) Stigma; (*c*) Ovary: (*d*) honey disc.

(3) *Strobilanthes foliosus* T. And. or *Zenkerianus* T. And.

A.—Four outer leaves or leafy bracts.
B.—Inner bracts.
C.—Flower with calyx divided to the middle in *S. foliosus* to the base in *S. Zenkerianus*.
D.—Section of flower of *S. foliosus*.
E.—Stamens of *S. Zenkerianus*.

(4) *Strobilanthes consanguineus* C. B. Clarke.

A.—Section of flower showing stamens.

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(5) *Strobilanthes Lawsoni* Gamble.

A.—Section of flower showing stamens.
B.—Ovary on honey disc, and calyx.

(6) *Strobilanthes Wightianus* Nees.

A.—A flower with calyx C and bracts B.
B.—Section showing stamens.

(7) *Strobilanthes Perrottetianus* Nees.

A.—Section showing stamens.

(8) *Strobilanthes urceolaris* Gamble.

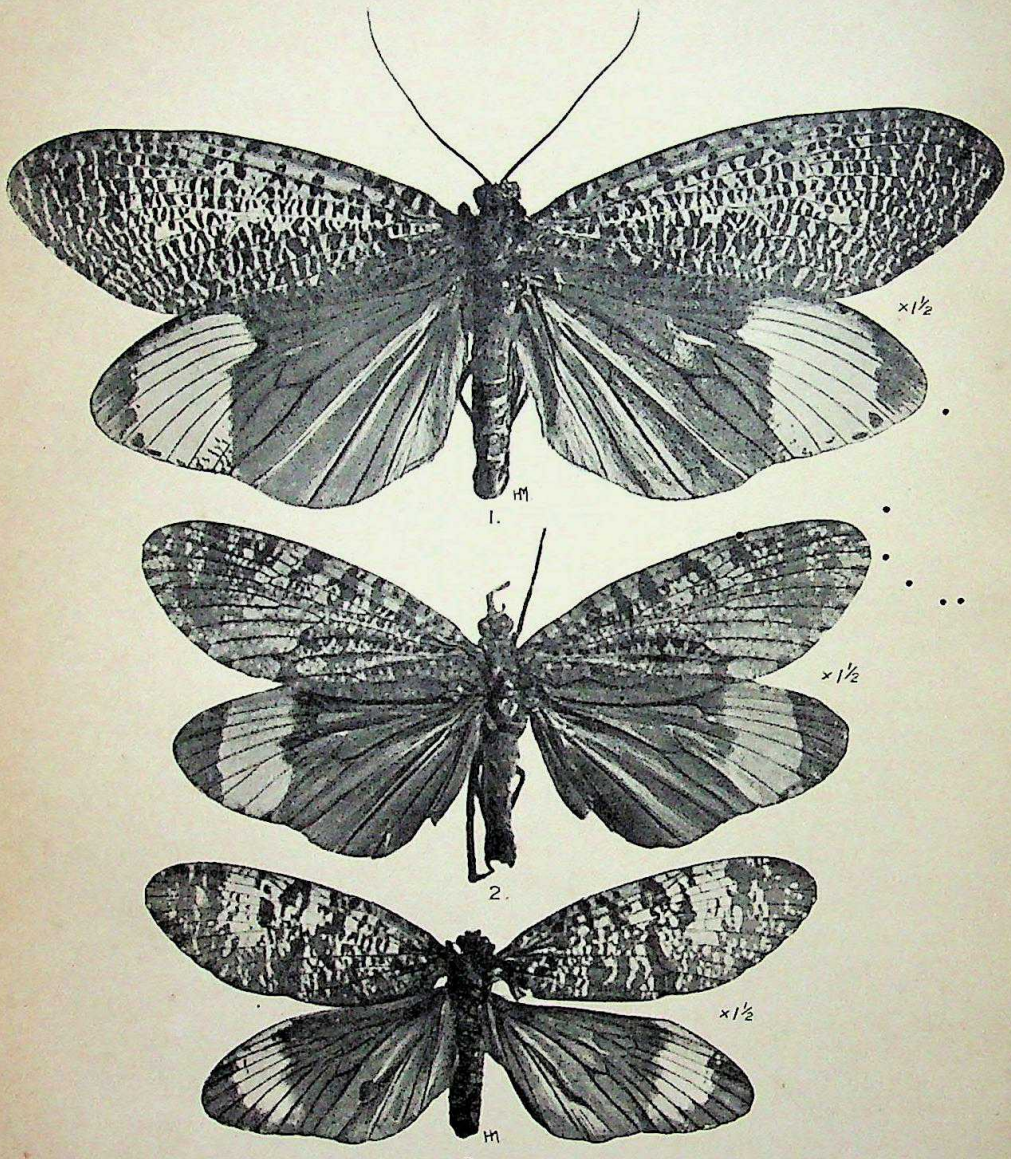
A.—Flower with calyx.
B.—Ovary on honey disc.
C.—Section showing stamens.

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Photos. A. B. Martinov, & D. E. K.

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1. EUBASILISSA MCLACHLANI, White, ♀. 2. EUBASILISSA REGINA, Mc L., ♂.
3. EUBASILISSA TIBETANA, Mart., ♀.

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THE INDIAN CADDIS-FLIES (*TRICHOPTERA*).

BY

MARTIN E. MOSELY, F.B.E.S.

PART III.

(*With thirteen plates*).

(*Continued from page* 629 *of volume* XXXVII).

INAEQUIPALPIA

PHRYGANEIDAE

Burmeister, Handb. Ent., p. 922, 1839.

CHARACTERS OF THE FAMILY.

Antennae stout, generally as long as the anterior wing but sometimes much shorter and, in *Limnocentropus* serrated on the under side in the basal and middle portions; first joint stouter than the others. Ocelli present. Maxillary palpi four jointed in the male, five jointed in the female, similar in structure in both sexes, only slightly pubescent; joints somewhat cylindrical, the basal joint short; labial palpi small, terminal joint generally ovate and spoon shaped. Wings varying in shape in the different genera; usually short and broad and, except in *Limnocentropus*, with rounded apices. In *Agrypnia* the wings are perhaps more elongate and bear a closer resemblance to those of the *Limnophilidae*. In the other genera they are covered with a short dense pubescence; nervures strong; discoidal cell closed in both wings, long and narrow in the anterior and short in the posterior; the first two apical sectors generally arise from its upper margin; median cell wanting; cellula thyridii very elongate; anterior wing with apical forks 1, 2, 3 and 5 in the male (except in *Limnocentropus*) and 1, 2, 3 and 5, sometimes 1, 2, 3, 4 and 5, in the female; posterior wing generally 1, 2, 5 in the male and 1, 2 and 5, sometimes 1, 2, 3 and 5 in the female; anterior wing usually with an additional cross vein uniting the costa and sub-costa; there is however only the one cross vein present in the genera *Limnocentropus* and *Agrypnia*. Legs generally stout and rather short; spurs 2, 4, 4; spines strong and short but sometimes practically absent. The genital appendages of the male vary somewhat according to the genera and species; the inferior appendages are generally strongly developed, two jointed, with the two joints more or less welded together; there is a dorsal plate covering a rather simply constructed penis which is often armed at its apex with a pair of strongly chitinised plates or hooks.

In so far as the records show, the *Phryganeidae* are represented in India by four (perhaps five) genera containing ten (perhaps

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eleven) species, a total which compares not unfavourably with that of the European fauna. Of these genera, *Oopterygia* has been elected on very slender grounds but a careful search has shown that there is a cross veinlet in *Eubasilissa* between the radius and sub-costa of the anterior wing which does not seem to occur in the former genus. *Eubasilissa* is amply distinguished from *Neuronia* (in which genus the species were formerly placed) by the presence of an additional fork in the anterior wing in the female sex. *Neurocyta* Navás is perhaps an aberrant *Eubasilissa*.

TABLE OF INDIAN GENERA.

1. Fork 1 absent in both wings. LIMNOCENTROPUS Ulmer.
—Fork 1 present in both wings. 2
2. Insects of moderate size, anterior wing about 12 mm. long; only one cross vein between costa and sub-costa. AGRYPNIA Curtis.
—Insects very large, excepting *Oopterygia minor*, anterior wing 20 mm. or more long; an additional cross vein between costa and sub-costa. 3
3. A cross vein connecting the sub-costa and the radius. EUBASILISSA Martynov. ? NEUROCYTA Navás.
—No cross vein between the sub-costa and radius. OOPTERYGIA Martynov.

Eubasilissa Martynov.

Eubasilissa Martynov	— Proc. Zool. Soc. Lond., No. 5, Pt. I, p. 87, 1930.
Regina Martynov	— Ann. Mag. Nat. Hist. (9), vol. xiv, p. 215, 1924.
Neuronia Leach partim	— Edinburgh Encyc., vol. ix, p. 136, 1815.

Insects very large; ocelli present; anterior wings broad; discoidal cell moderately long; an additional cross vein between the costa and sub-costa and also a cross vein uniting the sub-costa and radius; forks 1, 2, 3 and 5 present in the anterior wings in the male, 1, 2, 3, 4 and 5 in the female; in the posterior, 1, 2 and 5 in the male, 1, 2, 3 and 5 in the female; anterior wing, membrane yellow, sometimes with irregular fuscous bands in the anterior portion and mostly with a fuscous net, partly confluent in the median and apical portions; posterior wing brown or fuscous, sometimes purple with a broad transverse yellow band in the apical half. Inferior appendages ♂ two-jointed, with the two joints welded together, the line of juncture being not easy to define excepting in a balsam preparation.

Genotype: *Eubasilissa regina* McL.

The three known species are easily separated by their wing pattern as may be seen on consulting the figures on the plate. Consequently a table of species is unnecessary here.

I am indebted to Mr. A. B. Martynov for his fine photographs of *E. mclachlani* and *E. tibetana* and to the Zoological Society of London for kind permission to reproduce them from the Proceedings.

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Eubasilissa regina McLach. (Pl. I, fig. 2; Pl. II, figs. 4-6).

Holostomis mclachlani White var. *regina* McLach.	—	Journ., Linn. Soc. Lond. Zool., vol. xi, pp. 103-104, 1871.
Holostomis regina Matsumura	—	Thous. Ins. Japan, Pl. 12, fig. 1, 1904.
,, ,, Matsumura	—	Syst. Ent., 1, p. 168, f. 219, 221, 1907.
Neuronia (*Holostomis*) *regina* McLach	—	Ann. Mag. Nat. Hist., Ser. vi, vol. xiii, p. 421, 1894.
Neuronia regina Hagen	—	Ver. Zool. bot. Ges. Wien, vol. xxiii, p. 396, 1873.
,, ,, Ulmer	—	Gen. Insect., fasc. 60a, p. 24, Pl. 29, fig. 3, 1907.
,, ,, Ulmer	—	Coll. Selys, fasc. 6a, figs. 1-3, Pl. 1, fig. 1, 1907.
,, ,, Ulmer	—	Deutsch. Ent. Zeit., pp. 239-240, 1908.
,, ,, Ulmer	—	*op. cit.*, p. 400, 1911.
,, ,, Nakahara	—	Can. Ent., vol. xlv, p. 323, 1913.
Regina regina Martynov	—	Ann. Mag. Nat. Hist. (9), vol. xiv, p. 215, 1924.
,, ,, Ulmer	—	Arch. Naturg., vol. xci, Abt. A, Heft 5, p. 62, 1925.
Eubasilissa regina Martynov	—	Proc. Zool. Soc. Lond., No. 5, Pt. I, pp. 87-88, 110-111, 1930.
,, ,, Ulmer	—	Pekin Nat. Hist. Bull., vol. vii, p. 147, 1932.
,, ,, McLach.	—	Iconographia Insectorum Japonicum, p. 1500, 1932.

Anterior wings with a yellow ground heavily mottled with brown markings; these coalesce towards the apex of the wing making a darkish patch in this region; there are eight or nine confluent groups of brown spots along the costal margin of each wing and dark spots along the apical margin at the extremities of the apical sectors. There is an indistinct lightening in colour forming a band across the anterior wing corresponding with and continuing the yellow band of the posterior wing. Posterior wings coloured dark purple brown with a broad transverse yellow band towards the apex extending from the lower to the upper margin and leaving a considerable dark patch at the extreme apex; three or four dark spots on the extreme lower margin of the yellow band.

Length of anterior wing ♂ 34 mm.

Length of anterior wing ♀ 38 mm.

Habitat.—Kulu, Japan, China, Formosa.

Location of the type not indicated but probably in the McLachlan collection.

Eubasilissa regina was considered by McLachlan to be merely a variety of *mclachlani* White. There are, however, ample

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distinctions in the male genitalia as may be seen on a comparison of the figures of these parts and also distinct differences in the pattern of the wings.

Eubasilissa mclachlani White (Pl. I, fig. 1; Pl. III, figs. 7-10; Pl. IV, figs. 11-12).

Holostomis m'Lachlani White — Zoologist, vol. xx, p. 7860, 1862.
" " White — Proc. Ent. Soc. Lond., Ser. 3, vol. i, p. 26, 1862.
" " Hagen — Ver. Zool. bot. Ges. Wien, vol. xiv, p. 820, 1864.
Holostomis maclachlani McLach. Journ. Linn. Soc. Lond. Zool., vol. xi, p. 103, 1871.
Phryganea maclachlani McLach. — Trans. Ent. Soc. Lond., Ser. 3, vol. v, pp. 249-250, Pl. xvii, fig. 1, ♀, 1866.
Neuronia maclachlani Hagen — Ver. Zool. bot. Ges. Wien, vol. xxiii, p. 395, 1873.
" " Betten — Rec. Ind. Mus., vol. iii, p. 242, 1909.
Neuronia mclachlani Ulmer — Notes Leyd. Mus., vol. xxviii, p. 103, 1906.
" " Ulmer — Gen. Insect., fasc. 60a, p. 24, 1907.
" " Ulmer — Coll. Selys, fasc. 6a, p. 6, 1907.
Regina mclachlani Martynov. — Ann. Mag. Nat. Hist. (9), vol. xiv, p. 215, 1924.
Eubasilissa mclachlani Martynov Proc. Zool. Soc. Lond., No. 5, Pt. I, pp. 87, 111, Pl. 1, fig. 1, 1930.

Anterior wings reddish orange, thickly and uniformly reticulated with blackish fuscous markings which do not coalesce to make definite blotches as in *regina;* there are two conspicuous whitish spots, one in the *cellula thyridii* and the other in the sixth apical cell. In *regina* these spots are far more indistinctly indicated. Posterior wings purple brown, a very broad orange coloured band occupying almost the entire apical third as in *regina;* the dark fuscous patch at the apex of the wing small as compared with that of *regina* and the dark spots on the lower margin of the orange band less conspicuous; there are seven or eight faintly indicated spots on the upper margin of the band as well.

There are marked differences in the male genitalia between the two species, special attention being directed to the strongly-formed tongue which arises at the centre of the terminal ventral segment (seen from behind) and meets a corresponding tongue descending from the lower penis cover to meet it. This feature is absent in *regina*.

Length of anterior wing ♂ 31 mm.
Length of anterior wing ♀ 40 mm.

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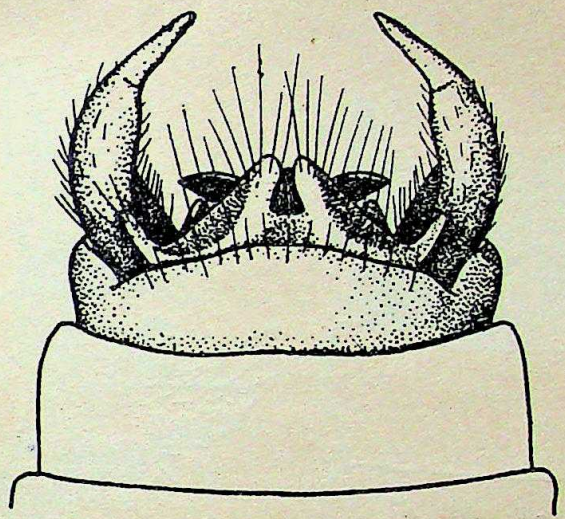


Fig. 4.

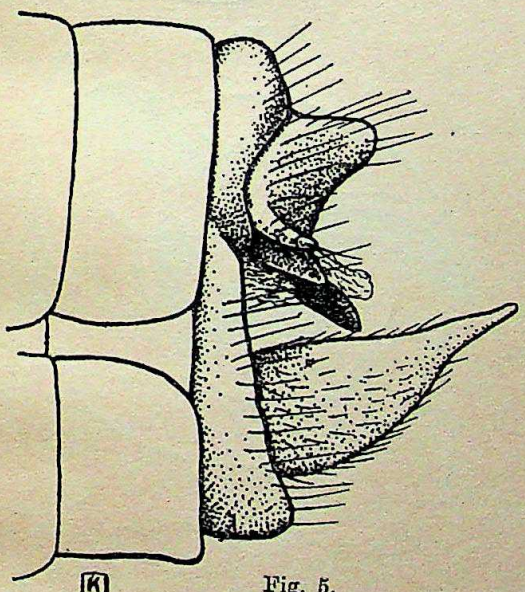


Fig. 5.

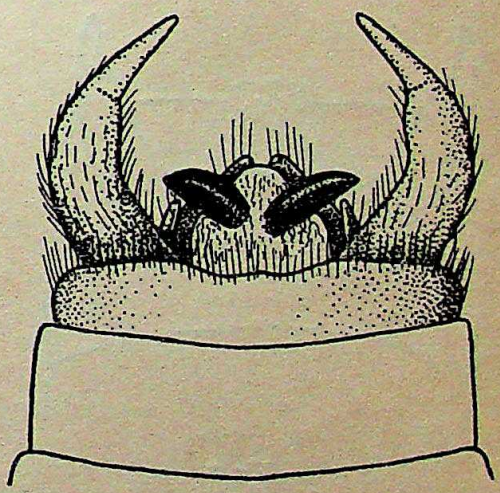


Fig. 6.

Eubasilissa regina, McL., ♂.

Fig.—4, genitalia dorsal; 5, lateral; 6, ventral.

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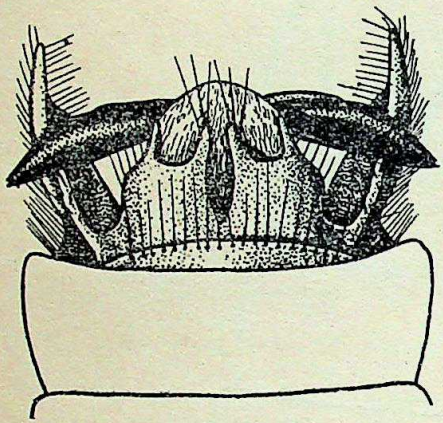


Fig. 7.

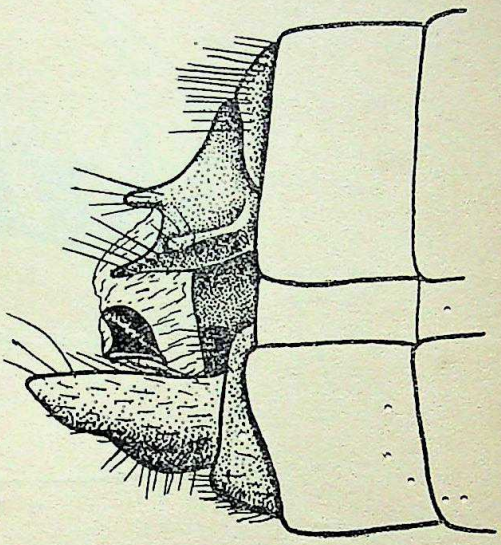


Fig. 8.

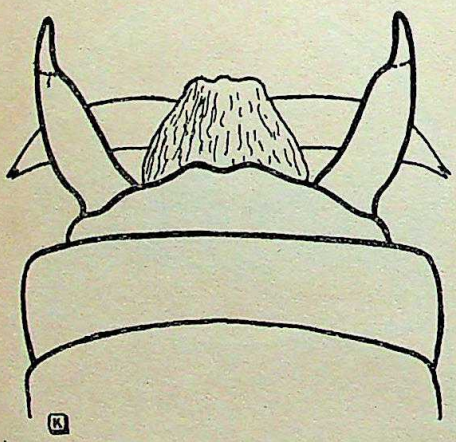


Fig. 9.

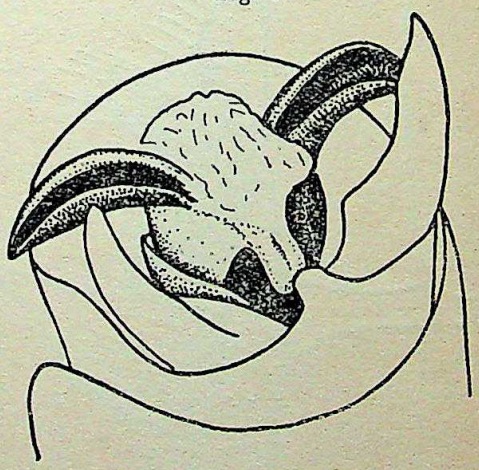


Fig. 10.

Eubasilissa mclachlani White, ♂.

Fig.—7, genitalia dorsal; 8, lateral; 9, ventral; 10, penis and inferior appendages obliquely from beneath.

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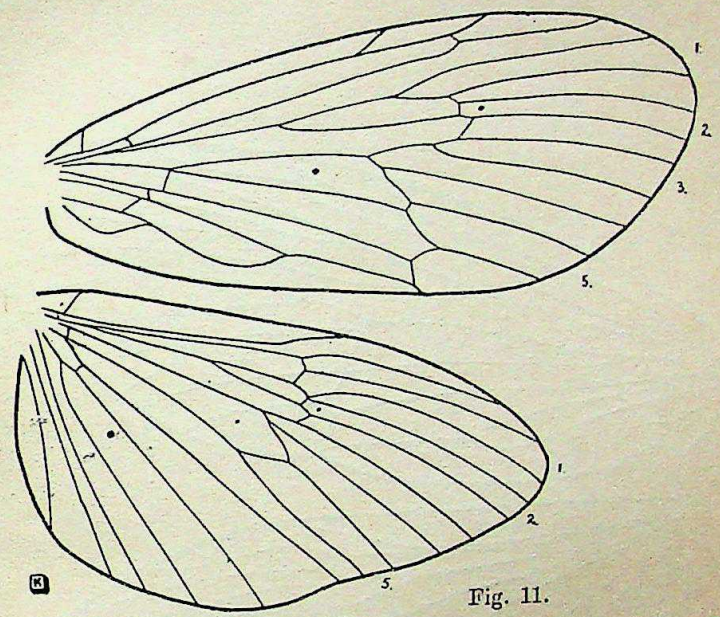


Fig. 11.

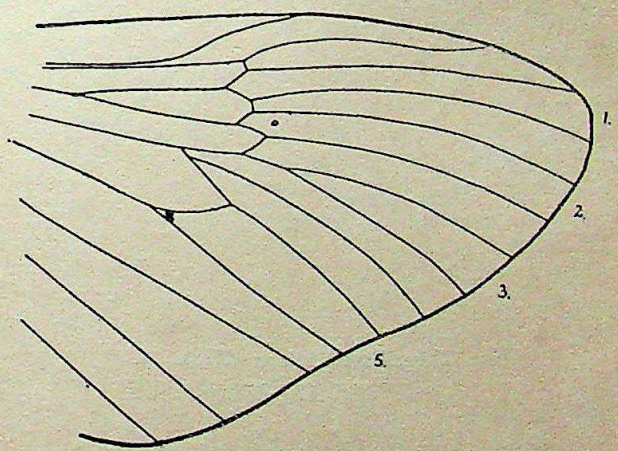


Fig. 12.

Eubasilissa maclachlani White.

Fig.—11, wings ♂; 12, apex of posterior wing ♀.

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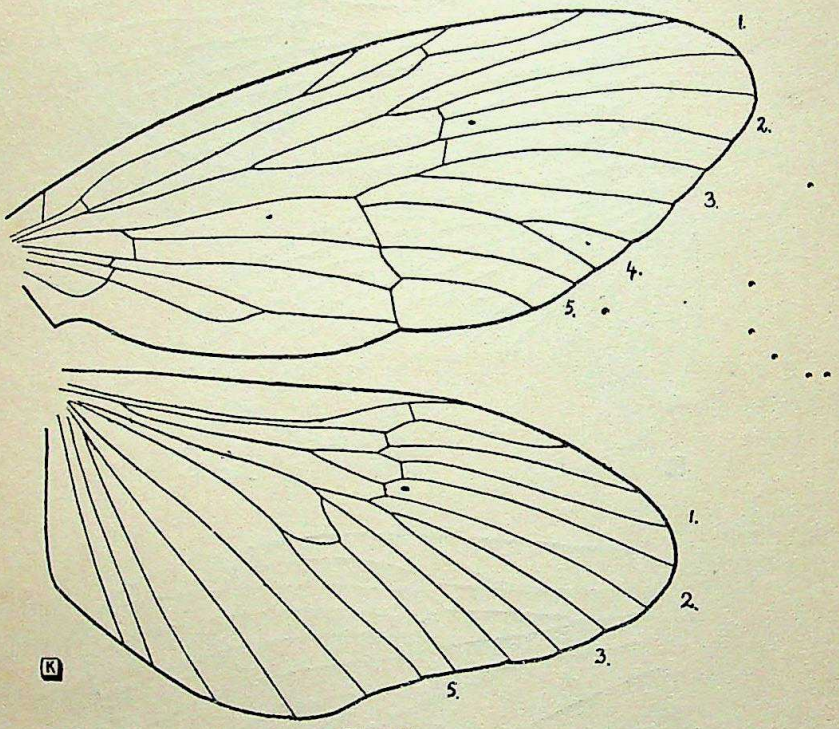


Fig. 13.

Eubasilissa tibetana Mart., ♀.
Fig. 13.—Wings.

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Habitat.—Darjiling, Assam, Kulu.
Type ♀ in the collection of the British Museum.

Eubasilissa tibetana Martynov (Pl. I, fig. 3; Pl. V, fig. 13).

Eubasilissa tibetana Martynov, Proc. Zool. Soc. Lond., No. 5, Pt. I, pp. 88-111, Pl. 1, fig. 2, 1930.

Pattern of the wings very similar to that of *regina*. Dark blotches along the costal margin of the anterior wing scarcely evident; apical and lower margins of the wing darkly-clouded; a clear patch extending down from the costal margin to rather more than half-way. In the posterior wing, the yellowish transverse band is smaller than in either of the other two species and does not extend as far as the lower margin of the wing; ♂ unknown.

Length of anterior wing ♀ 32 mm.

Habitat.—Sikkim, Tibet.

Type and paratypes ♀ in the collection of the British Museum: paratype ♀ in the Zoological Museum, Leningrad.

The absence of the strongly indicated blotches along the costal margin of the anterior wing and the more confined area of the yellow band of the posterior wing suffice to separate this species from *regina* which is moreover considerably larger. The wing pattern is abundantly distinct from that of *mclachlani*. It is to be hoped that the male will be discovered in order that some idea of the genitalia may be obtained.

Oopterygia Martynov.

Oopterygia Martynov, Proc. Zool. Soc. Lond., No. 5, Pt. I, pp. 88-89, 1930.

Anterior wings very broad, almost oval, darkish-yellow with uniform pale yellow reticulation or orange with brown spots; an additional cross-vein between the costa and sub-costa; no cross-vein between the sub-costa and radius; posterior wings broad, either uniformly reticulated as in the anterior or else dark fuscous with a broad yellow band occupying the distal area as in *Eubasilissa*. Superior appendages absent, inferior appendages rather long, distinctly two jointed, second joint short, sub-oval or capitate, welded to the first. Ocelli present, spurs probably 2, 4, 4, but both posterior legs are missing in the unique genotype, and the spurs are not mentioned in the description of *O. asiatica* Betten.

Genotype: *Oopterygia brunnea* Martynov.

Three species in this genus are known, *brunnea* Martynov, *asiatica* Betten, *minor* sp. n. described herein, *asiatica* being distinguished by the yellow band across the dark ground-colour of the posterior wing. They may be separated from *Eubasilissa* species by the rather more ovate shape of the wings and the absence of the cross vein between sub-costa and radius.

The additional cross vein between the costa and sub-costa in the anterior wing is omitted in Martynov's description of *brunnea*, but a re-examination of the type has shown that it is present. It is indicated by Betten in his figure of *asiatica*.

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Oopterygia brunnea Martynov (Pl. VI, figs. 14-17).

Oopterygia brunnea Martynov, Proc. Zool. Soc. Lond., No. 5, Pt. I, pp. 89-91, 111, figs. 33-36, 1930.

Head and thorax brown, antennae dark reddish-yellow with indistinct annulations, palpi brownish. Anterior wing broad, egg-shaped, rounded at the apex; ground-colour uniformly pale greyish-testaceous or somewhat brownish, densely and uniformly irrorated with indistinct round pale confluent spots; fringes very short, pale yellowish; membrane finely granulose clothed with short brownish hairs; nervures testaceous. Legs reddish-brown with short yellow hairs, femora somewhat lighter in colour, spines black, spurs 2, 4 (4?) reddish-yellow.

The single species has lost both posterior legs but there can be little doubt that the spurs would number 4 in accordance with the Family characters.

Length of anterior wing ♂ 22 mm.

Habitat.—Tibet, Yatung, 4,500 ft.

Type ♂ in the collection of the British Museum.

Oopterygia asiatica Betten (Pl. VII, figs. 18-19).

Neuronia asiatica Betten	— Rec. Ind. Mus., vol. iii, Pt. III, p. 242, Pl. xviii, figs. 15-16, 1909.
? *Neuronia asiatica* Martynov	— Ann. Mag. Nat. Hist. (9), vol. xiv, p. 216, 1924.
Oopterygia asiatica Martynov	— Proc. Zool. Soc. Lond., No. 5, Pt. I, pp. 89-91, 11, 1930.

Head and thorax dark brown; eyes black, ocelli yellow. Anterior wings orange with brown spots, the largest spots along the costa and apical margins covering the tips of the veins, a particularly large spot on the tip of the Sc.; there is an irregular brown band following the line of the anastomosis from the first branching of the media to the tip of the anal veins. The posterior wing has the basal two-thirds dark-brown, the distal third is yellow. There is an interrupted apical band of brown, the brown spots being on and along the tips of the veins. The abnormality of venation shown in the anal veins of the posterior wing occurs in both wings of the specimen.

Length of body ♂ 15 mm.; expanse 41 mm.

Habitat.—Sibsagar, Assam.

Type ♂ in the collection of the Indian Museum, Calcutta.

I am unacquainted with this fine insect and so give Betten's description as published in the records of the Indian Museum. His figures of neuration and genitalia indicate a close affinity to Martynov's *O. brunnea.*

Oopterygia minor sp. n. (Pl. VIII, figs. 20-23).

Head very dark fuscous, oculi black; antennae almost entirely wanting in the unique type, basal joint fuscous, palpi fuscous;

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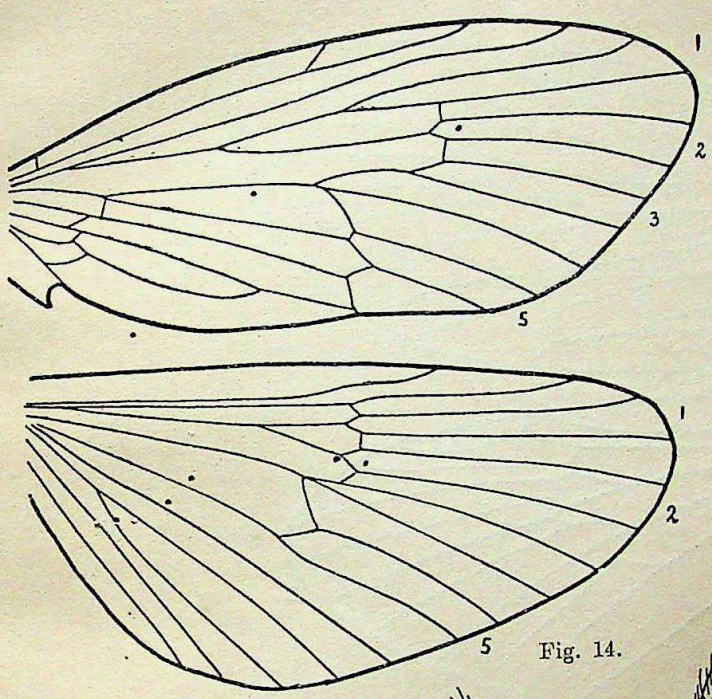


Fig. 14.

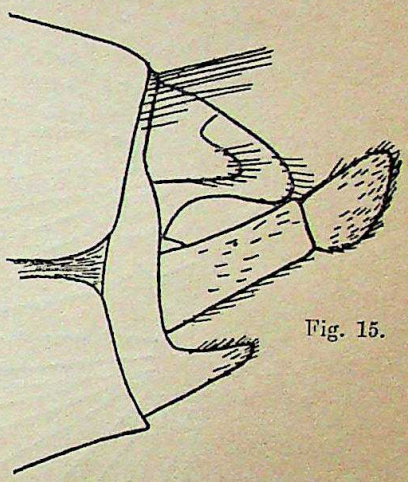


Fig. 15.

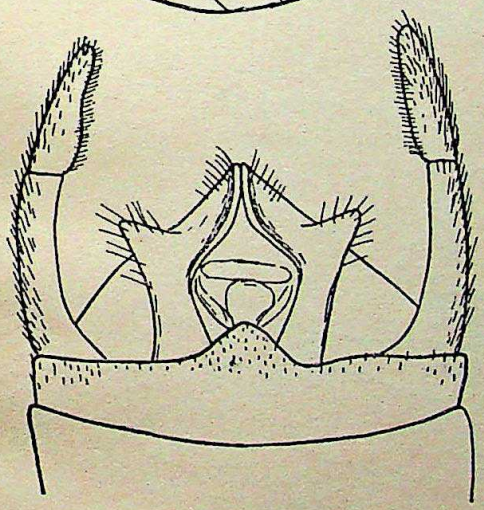


Fig. 16.

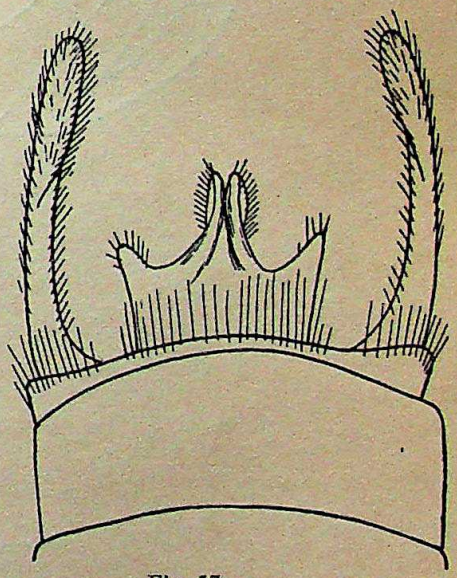


Fig. 17.

Oopterygia brunnea Mart., ♂.

Fig.—14, wings; 15, genitalia lateral; 16, ventral; 17, dorsal (*genitalia after Martynov*).

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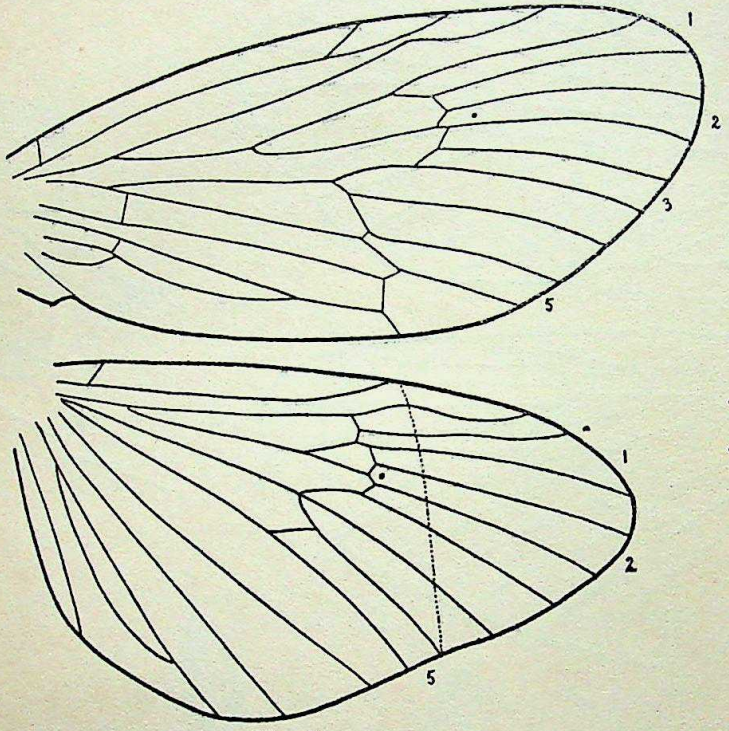


Fig. 18.

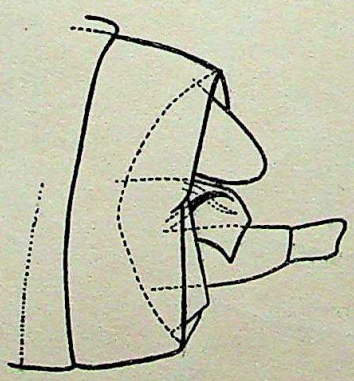


Fig. 19.

Oopterygia asiatica Betten, ♂.

Fig.—18, wings; 19, genitalia lateral (*after Betten*).

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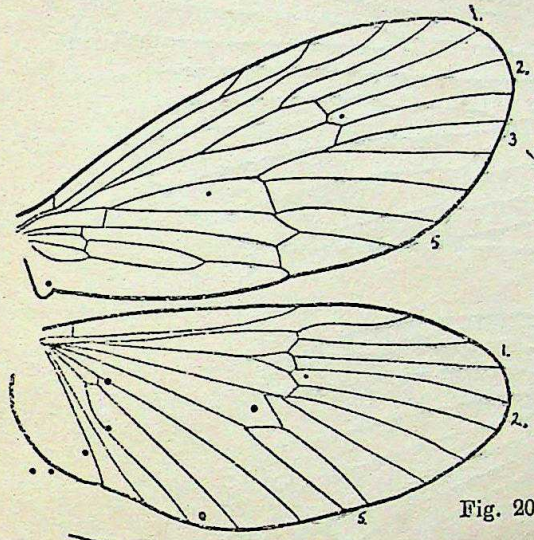


Fig. 20.

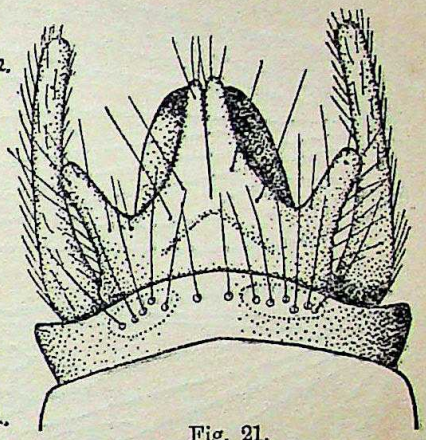


Fig. 21.

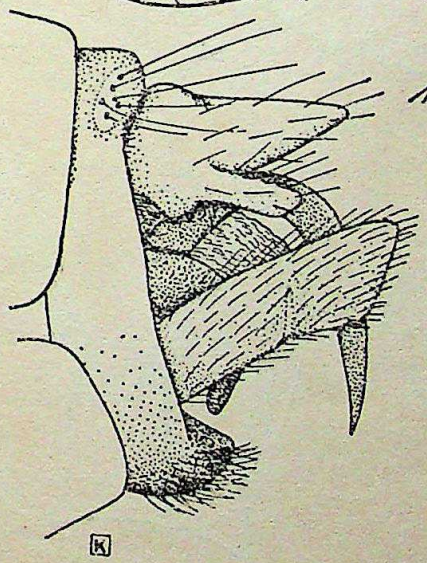


Fig. 22.

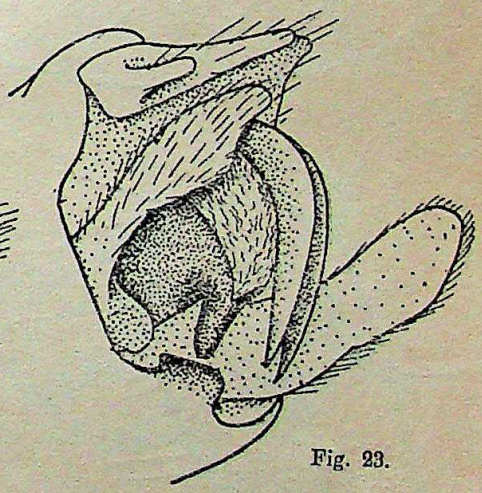


Fig. 23.

Oopterygia minor sp. n., ♂.

Fig.—20, wings; 21, genitalia dorsal; 22, lateral; 23, ventral, oblique, slightly from behind.

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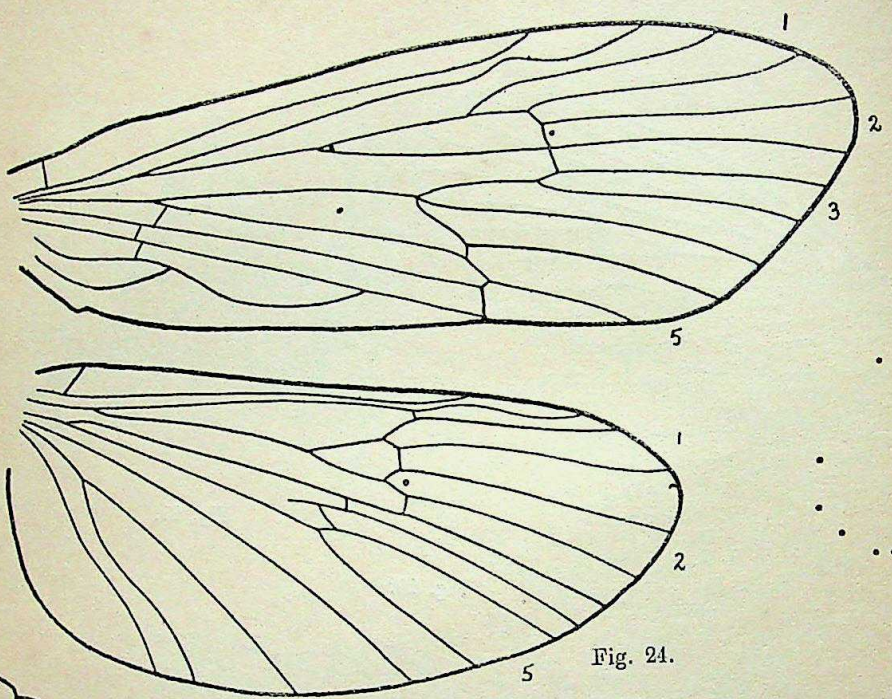


Fig. 24.

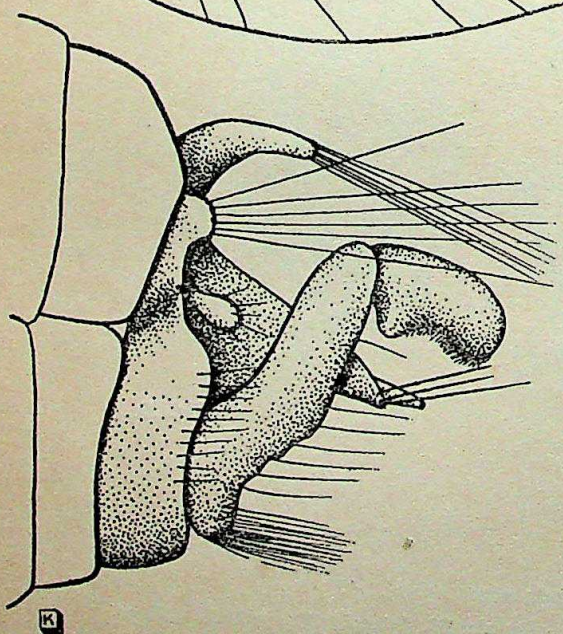


Fig. 25.

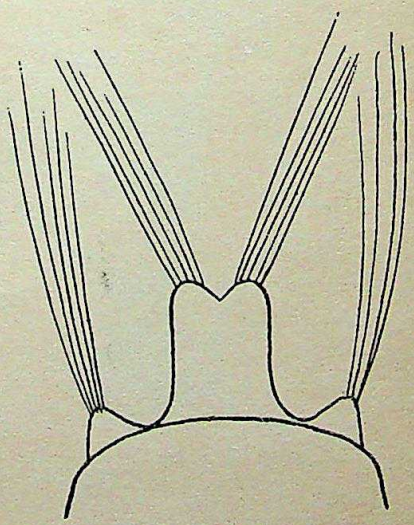


Fig. 26.

Agrypnia picta Kol. var. **tibetana** Mart., ♂.

Fig.—24, wings; 25, genitalia lateral; 26, dorsal plate.

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legs mostly wanting, spurs pale and thin; wings short and rounded, anterior fuscous irrorated with pale spots.

Genitalia ♂. Margin of the ninth dorsal segment from above evenly rounded with two conspicuous light coloured warts bearing long hairs; beyond the dorsal margin projects a trifid plate, central projection excised with a deep slit; there are two large penis-sheaths strongly chitinised and curving downwards; penis membranous; lower penis cover in the form of a black, strongly chitinised hook arising from a broad base with the apex very slightly excised, and directed downwards towards a raised strongly chitinised blunt nodule situated at the centre of the margin of the ninth ventral segment and with its surface covered with short dark setae; inferior appendages parallel-sided with a short terminal joint fused to the basal joint, apex from the side, obliquely truncate.

Length of anterior wing ♂ 12 mm.

N.-E. Burma, Kambaiti, 7,000 ft., 13-22-6-1934, R. Malaise.

Type ♂ in the Stockholm Museum.

This is the smallest of the known Indian *Phryganeidae*.

Neurocyta Navás.

Neurocyta Navás, Mem. Ac. Cienc. Art. Barc., vol. xii, No. 13, p. 240, 1916.

Navás sates that the genus is similar to *Neuronia*, differing mainly in the presence of an additional cross vein dividing the discoidal cell of the posterior wing into two portions.

The genus *Neuronia* not being as yet recorded in India, the comparison should be made with Martynov's genus *Eubasilissa*.

Genotype: *Neurocyta arenata Navás.*

Neurocyta arenata Navás.

Neurocyta arenata Navás, Mem. Ac. Cienc. Art. Barc., vol. xii, No. 13, pp. 240-241, fig. 1, 1916.

Figures of the ♂ wing are given showing an aberrant discoidal cell in the posterior wing. No figures of the genitalia are given. I have not seen the single male example which is in Senor Navás's collection in the Barcelona Museum, but the curator Senor Espanol, has kindly sent me a photograph of the type.

Length of anterior wing ♂ 24.5 mm.

Habitat.—Darjiling, 1910.

Agrypnia Curtis.

Agrypnia Curtis		— Brit. Ent., p. 540, 1835.
,, Hagen		— Ver. Zool. bot. Ges. Wien, vol. xxiii, p. 430, 1873.
,, McLachlan		— Rev. and Syn. Trich., p. 28, 1874.
Phrophryganea (partim)	Martynov	Ann. Mus. Acad. Imp. Sci. Peters., vol. xiv, p. 259, 1909.
,,	Martynov	Ann. Mag. Nat. Hist. (9), vol. xiv, pp. 210-211, 1924.

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Anterior wing with very slight pubescence, rather narrow, apex obliquely truncate, only one nervure, at the base, between the costa and sub-costa; forks 1, 2, 3 and 5 present in the anterior wing of the ♂, 1, 2, 3, 4 and 5 in the ♀; forks 1, 2 and 5 in the posterior wing in both sexes. Ocelli present. Spurs 2, 4, 4. The form of the insect is much more elongate than in the other genera of the *Phryganeidae* and the species might be easily but mistakenly placed amongst the *Limnophilidae*. The neuration shows a tendency to aberration, particularly in the posterior wing.

Genotype: *Agrypnia pagetana* Curt.

Only one species has been recorded as belonging to the Indian fauna namely *A. picta* in Tibet and Martynov considers that the Tibetan form should rank as a variety.

Agrypnia picta Kol. var. **tibetana** Martynov (Pl. IX, figs. 24-26).

Prophryganea picta Martynov — Ann. Mus. Acad. Imp. Sci. Peters., vol. xiv, p. 259, 1909.

Prophryganea picta var. *tibetana* Martynov — Proc. Zool. Soc. Lond., No. 5, Pt. I, pp. 91-111, 1930.

Agrypina picta var. *tibetana* Ulmer — Pekin Nat. Hist. Bull., vol. vii, p. 150, 1932-33.

Anterior wings more or less brownish as the brown spots are very indistinct and diffuse. In the male genitalia the dorsal plate is rather longer than in European typical examples of *picta* and the second joint of the inferior appendage is somewhat longer and not so dilated.

Length of anterior wing ♂ 14 mm.

Length of anterior wing ♀ 15 mm.

Habitat.—Tibet.

Type ♂ and paratype ♀ in the collection of the British Museum.

Limnocentropus Ulmer.

Limnocentropus Ulmer — Coll. Selys, fasc. 6a, pp. 13-14, figs. 21-23, 1907.

,, Ulmer — Gen. Insect., fasc. 60a, p. 28, 1907.

,, Martynov — Ann. Mag. Nat. Hist. (9), vol. xiv, p. 213, 1924.

Head broad and short, ocelli present and conspicuous; antennae somewhat shorter than the anterior wing, rather slender, the basal half serrated on its under side. Maxillary palpi stout; in the ♀, first joint very short, second long, third still longer, fourth about as long as the second, fifth slightly shorter than the third; in the ♂, they correspond to the second, third, fourth and fifth of the ♀. In the labial palpi, the third joint is not oval as in many of the *Phryganeidae*. Wings ovate, broad, clothed with thick brown pubescence; apices in the male blunter than in the

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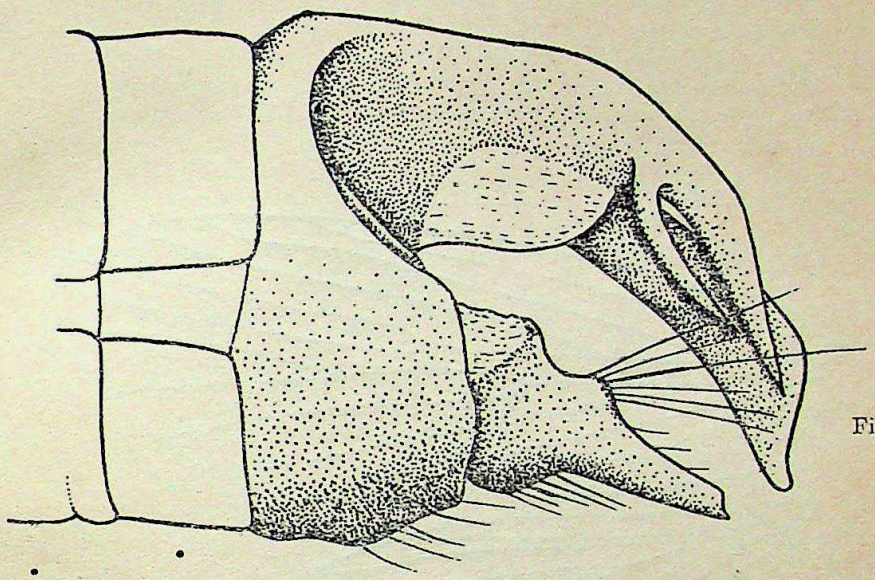


Fig. 27.

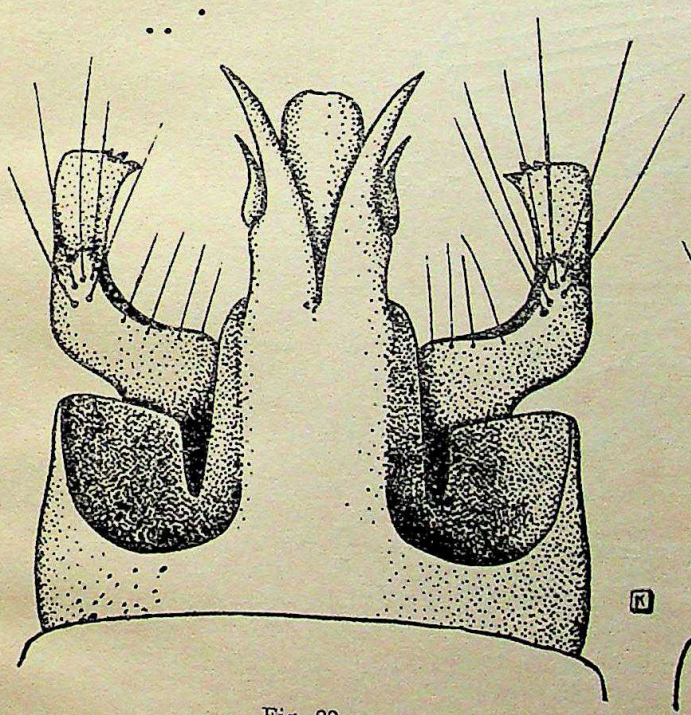


Fig. 28.

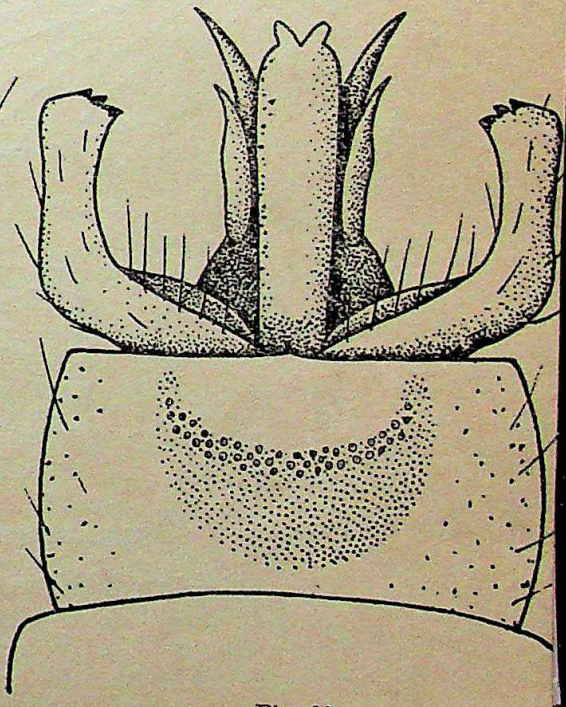


Fig. 29.

Limnocentropus insolitus Ulm., ♂.

Fig.—27, genitalia lateral; 28, dorsal; 29, ventral.

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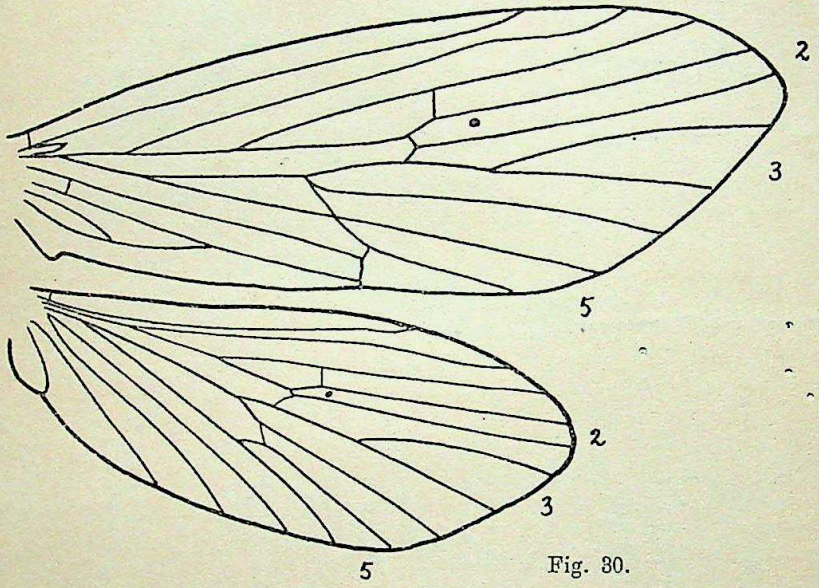


Fig. 30.

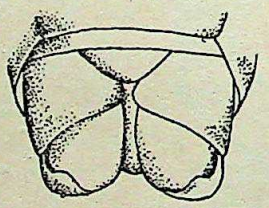


Fig. 31.

Limnocentropus insolitus Ulm., ♀.

Fig.—30, wings; 31, genitalia dorsal (*after Ulmer*).

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female; neuration alike in both sexes; forks 2, 3 and 5 present in both wings, fork 3 with a foot-stalk; discoidal cell closed, smaller in the posterior than in the anterior. Legs with spurs 2, 4, 4; spurs of equal length and densely clothed, like the legs, with adpressed hairs, median leg of ♀ not dilated. Genitalia male with a well developed down curved dorsal plate and simple curved inferior appendages, elbowed towards the centre; penis simple. Seventh sternite produced at its centre in a shallow lobe.

Genotype.—*Limnocentropus insolitus* Ulmer.

Limnocentropus insolitus Ulmer (Pl. X, figs. 27-29; Pl. XI, figs. 30-31).

Limnocentropus insolitus Ulmer — Coll. Selys, fasc. 6a, pp. 13-14, figs. 21-23, 1907.
" " Ulmer — Gen. Insect., fasc. 60a, p. 28, 1907.
" " Ulmer — Notes Leyd. Mus., vol. xxix, p. 2, figs. 1-2, 1907.
" " Nakahara Can. Entom., vol. xlv, No. 10, p. 327, 1913.
" " Martynov Ann. Mag. Nat. Hist. (9), vol. xiv, p. 213, 1924.
" " Ulmer — Arch. Naturg., vol. xci, Abt. A, Heft. 5, p. 63, 1925.
" " Martynov Proc. Zool. Soc. Lond., No. 5, Pt. I, pp. 91, 110, 111, 1930.
" " Ulmer — Pekin Nat. Hist. Bull., vol. vii, p. 148, 1932-33.

The whole insect is of a deep smoky chocolate-brown; head, thorax and abdomen black and in general appearance not differing in any marked respect from *fletcheri* and Martynov's subspecies *himalayanus*.

Genitalia ♂.—Eighth tergite straight; ninth tergite is produced at its centre in a very long dorsal process, the apical half cleft in two slender diverging forks with acute spine like apices; from the side, the process is very broad towards the base tapering to an acute point and, at about the centre there arises on each side, from the lower lateral margin directed backward, a short curved spine, which may be seen from above, projecting on each side of the central forks; below this process is the penis which is long, curving downwards with an obliquely truncated apex; from beneath the apex is seen to be divided to make a small membranous fork; the inferior appendages from the side narrowing to acute apices with slight blunt projections towards the base on the upper margins furnished with tufts of long hairs; from above the appendages are broader at the base and are strongly elbowed, apices truncate and serrate.

Length of anterior wing ♂ 12 mm..

The above description has been drawn up from the Japanese example in the Berlin Museum kindly lent for the purpose by

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Dr. H. Bischoff. The type of the species is a ♀ example, also from Japan in the De Selys collection in Brussels.

Ulmer states that he has seen an example from Darjiling in the Paris Museum but the specimen cannot now be found. In his list of *Chinese Trichoptera*, he gives the distribution as China, Japan, Darjiling and Sikkim but *insolitus* may well have been confused with the new species *fletcheri* described below and I have some doubt as to whether it should rightfully be included in the Indian fauna.

Limnocentropus insolitus Ulmer, subsp. **himalayanus** Martynov (Pl. XII, figs. 32-33).

Limnocentropus insolitus Ulmer, Proc. Zool. Soc. Lond., No. 5,
subsp. *himalayanus* Martynov — Pt. I, p. 91, 1930.
Ulmer — Pekin Nat. Hist. Bull., vol. vii, p. 148, 1932-33.

Head much destroyed in the single example known, reddish-brown, basal joint of the antennae reddish, remainder wanting. Wings dark brown clothed with golden brown hairs.

Genitalia ♀.—Terminal dorsal segment strongly produced from above, and lying close on each side of the produced portion are two long chitinised plates joined at their apices by a membrane.

♂ unknown.

Length of anterior wing ♀ 13 mm.

This species may possibly be the ♀ of *L. fletcheri* sp. n.

Sikkim, Tsung-tang, 6,000 ft., 24, iv. 1924 (Mt. Everest Expedition), (Major R. W. G. Hingston).

Type ♀ in the British Museum collection.

Limnocentropus fletcheri sp. n. (Pl. XIII, figs. 34-37).

Head black, clothed with tawny hairs; antennae light ochraceous, strongly annulated with dark fuscous and distinctly serrate beneath nearly to the apex; maxillary palpi very dark fuscous, nearly black with groups of very short light coloured hairs at the apex of each joint. Wings uniformly dark brown clothed with short golden pubescence, rather less pointed at the apices than those of *insolitus*. Legs yellowish.

Genitalia ♂.—The margin of the eighth dorsal segment is widely excised with the centre of the excision somewhat convex; the ninth segment, the genital capsule, is produced at the centre of its dorsal margin in a long narrow yellow bifurcate dorsal plate with a narrow central upper lobe whose rounded apex projects slightly over the excision between the two forks whose apices are also rounded; side pieces of the ninth segment blunt, apices slightly excised as seen from the side, upper margin blackened and carrying a few stout hairs; penis short, stout and membranous, apex furnished with two short down turned hooks; inferior appendages from beneath, each very broad at its base with a wide rectangular excision at the centre of its inner margin so that it is abruptly narrowed in its apical half; apices from beneath directed slightly

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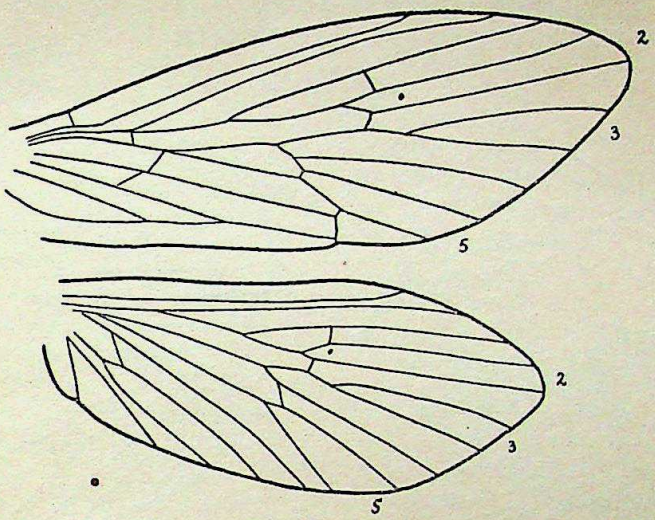


Fig. 32.

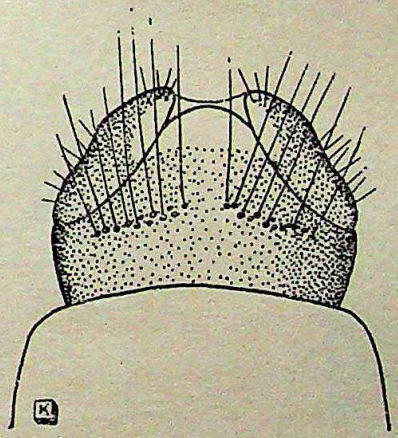


Fig. 33.

Limnocentropus insolitus Ulm. subsp. **himalayanus** Mart., ♀.

Fig.—32, wings; 33, genitalia dorsal.

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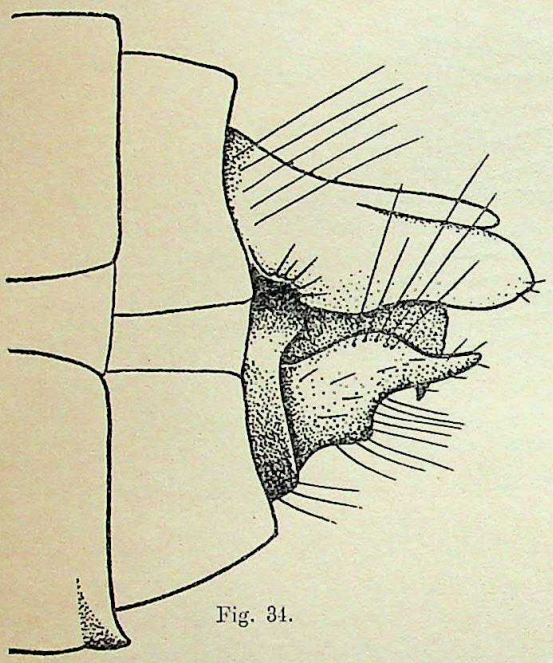


Fig. 34.

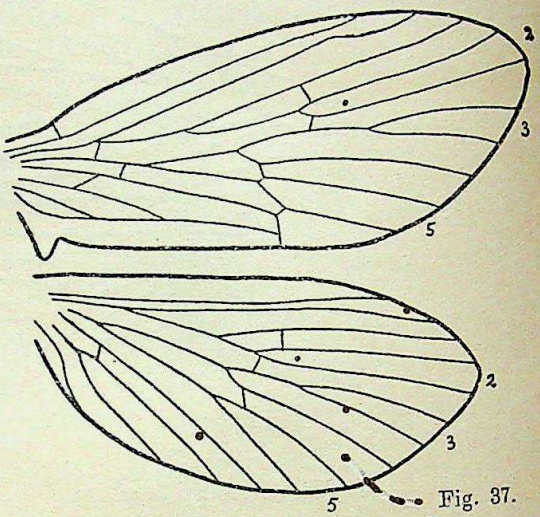


Fig. 37.

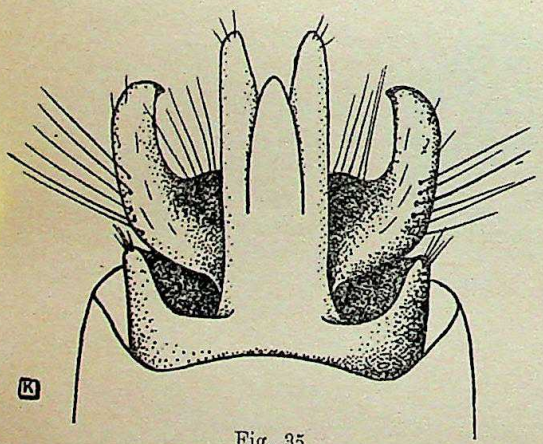


Fig. 35.

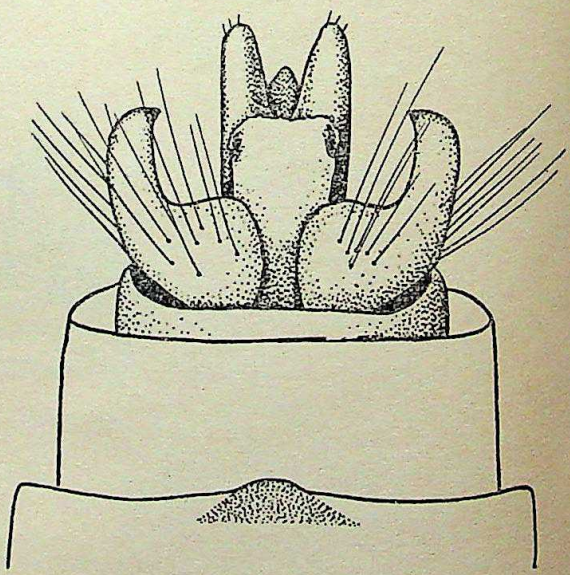


Fig. 36.

Limnocentropus fletcheri sp. n. ♂.

Fig.—34, genitalia lateral; 35, dorsal; 36, ventral; 37, wings.

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inward; from the side there is a projecting angle on the lower margin towards the base; the upper margin is convex and the appendage terminates in a slender finger. The margin of the seventh ventral segment is produced at its centre to make a short wide process which is strongly pigmented so as to give an exaggerated idea of its size.

Length of anterior wing ♂ 10 mm.

Habitat.—Sikkim. 5,000 ft., 18-30 April, 1922.

Type ♂ in the collection of the British Museum.

I have pleasure in dedicating this species to Fleet-Paymaster T. Bainbrigge Fletcher, whose extensive collection of *Indian Trichoptera* forms the basis of this series of articles.

(*To be continued*).

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A DESCRIPTION OF THE NOTODONTID MOTH *DUDUSA NOBILIS* WALKER, AND ITS EARLY STAGES.

(*With a Plate showing figs.* 1, 2, *photographs of male and female imagines respectively; fig.* 3, *the larva; and fig.* 4, *the pupa*).

BY

T. R. Bell, I.F.S. (Retd.).

(*With two plates*).

Imago.—Female antennae and frons of head dark-brown; thorax ochreous buff; mesothorax with a pair of dark-brown tufts; abdomen with long and large tuft of bob-ended hairs from end segment, brown with medial and lateral rows of pale spots. *Upper side*: Forewing ochreous, outer marginal area ashy-brown; termen crenulate with dark, pale-edged lunules in the crenulations; a dark, submarginal and pale postmedial, crenulated line; a dark-brown fascia from the middle of costa to outer angle; a triangular, brown patch on inner margin and at base of wing; two white patches on costa. Hindwing smoky brown with darker brown marginal lunules. *Under side*: Both wings pale brown with the marginal areas pale buff on which there are dark lunules; traces of crenulate median and submarginal lines; a dark spot at outer angle of cell of hindwing. Thorax underneath dark brown; of abdomen ochreous with brown markings. Legs brown; hind leg with a white spot at end of femur and tibia. Male similar to female; two white patches at costa with an additional white patch at base of forewing. Hindwing darker than in female. *Exp.* 99 mm. for female, 77 mm. for male.

The above was described from 20-year old specimens. In fresh examples the dorsum of abdomen is deep black as well as its terminal large tuft; the upper side of hindwings is also darker in the new specimens.

The moth sits at rest with the wings tightly folded against the body and the abdomen sometimes considerably upturned. It is impatient of light and flies after dusk. It is certainly not attracted by artificial light.

Larva.—Cylindrical in shape, slightly thickest in the middle, the segments well distinguished; anal segment rather convex, short, nearly semi-circular; 13 large and with its dorsal line slightly more inclined than that of 14, at an angle of about 45° to the longitudinal axis of the body; all prolegs and anal claspers developed in the normal way, their shanks rather cylindrical, brownish-red, ankles the same, the feet short; true legs stout, red. *Head* large, 8 mm. in diameter for the maximum breadth of body of 10 mm.; the surface minutely granulate, closely so, except on face where it is more sparsely so, shining, the hairs very minute; the colour, of a sealing-wax red colour, tinged brown; it is hardly bilobed but there is a slightly depressed, dorsal line; true clypeus one-third height of face, triangular, apex rounded, a slight constriction towards middle of sides, false clypeus half height of face, apex acute, broadening out from base upwards; labrum and ligula shining-black, thick and chitinized, the latter somewhat longer than former which is one-third length of true clypeus, the labrum with a deep-impressed, dorsal line and depressed, lateral areas near hinder margin; the ligula semi-circular with a deep, triangular sinus, its surface uneven; mandibles orange-brown, the ends broadly black, the cutting-edges entire; basal joint of antenna black, third dark-rusty, both shining; eyes arranged: the uppermost 2 diagonally placed behind the three 3, 4, 6 which are in a straight line, numbers 1, 2 close together, 3, 4 twice as far apart with 3 this distance from 2, number 6 twice as far below 4 as 4 is from 3, number 5 behind, forming an equilateral triangle with 4 and 6; all these eyes small, the line joining centres of 1 and 2 being really at right angles to that joining centres of 3, 4, 6. *Surface*: smooth and dull with the following stout, long, simple, yellow spines with black ends, that are perpendicular to the surface, some of them being slightly curved: one subdorsal, one supra- and one sub-spiracular to each segment 3 to 13; two small red-brown ones under the subspiracular ones of 5 and 6, one above the other and a single one in the same position on the other segments (on base of proleg or true leg or otherwise); a curved, dorso-lateral, extra spine on segments 3, 4, 13; segment 12 has an extra minute, subdorsal one near the hinder margin; 14 has six short, stout, red-brown, round hinder margin as well as a subdorsal-central one; segment 2 has a comparatively short, black, supra-spiracular spine and a very short, sub-spiracular one. *Spiracles* large, broadly oval, dull-black, flush, about

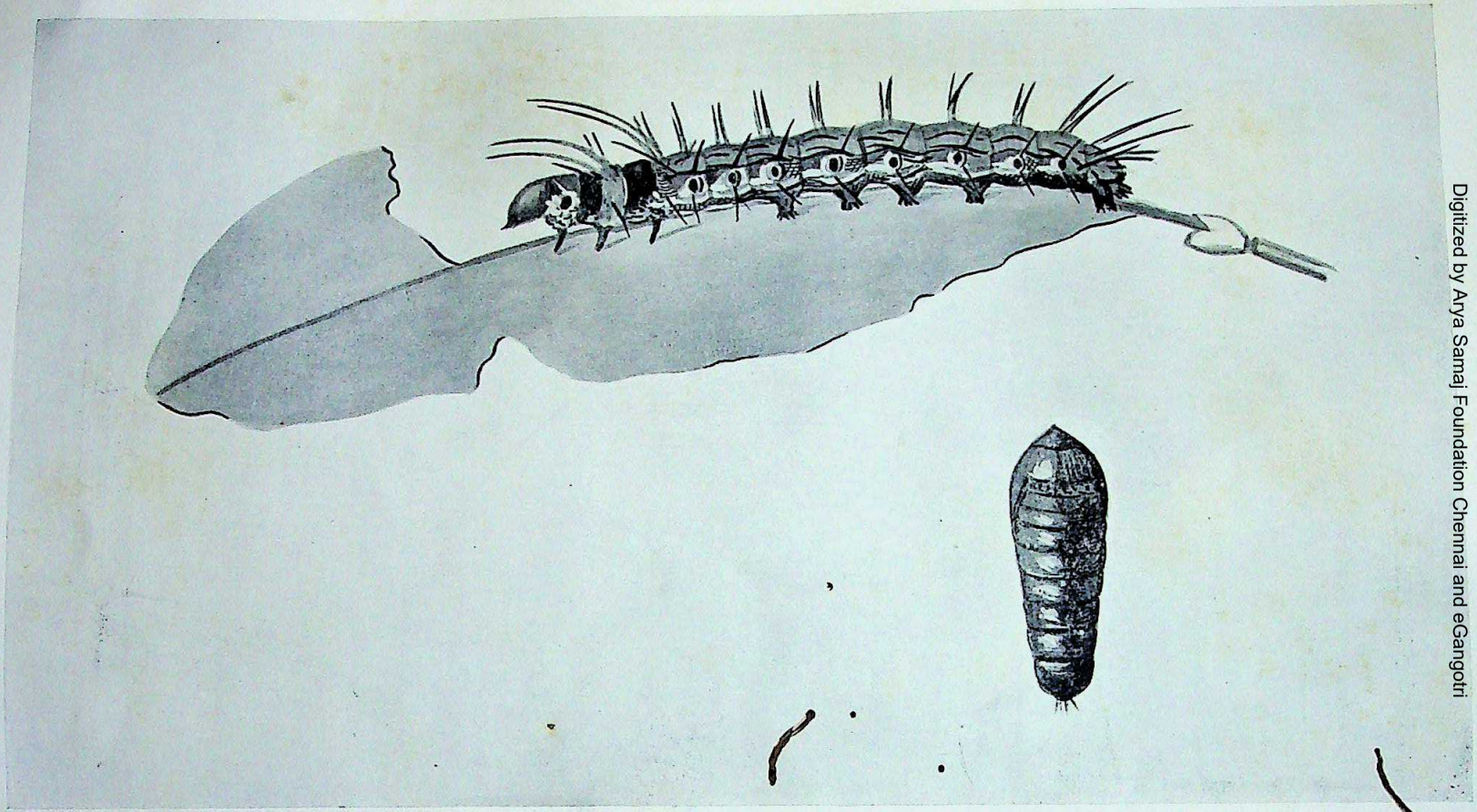
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The 'Yellow Peril' Moth (*Dudusa nobilis* Wlk.).
(Male above, female below.)

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The larva and pupa of the 'Yellow Peril' (*Dudusa nobilis*, Wlk.).

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one-seventh of a segment-length long and the width is more than half the length. *Colour* of body is clear canary-yellow; a brown-red, long collar dorsally to segment 2 with the anal flap, prolegs and claspers and a patch in front of and above each spiracle the same; spiracular region streaked shortly and longitudinally fairly closely with thin, black lines; a white, irregular, somewhat interrupted, sub-spiracular band that is about as broad as a spiracle is, this band wanting on 3, 4, 13 to 14; the whole of the anterior halves of dorsal somites 3 and 4 are velvety-black whence there is a thin and black, dorsal line to the hinder margin of 12; another short, also thin, black line from a dorsolateral point on front of each segment 4 to 12 to just below the base of the subdorsal spine and another on the same segments from just above that spine to hinder margin, as well as a third, twice gently waved, laterally bordering the lined spiracular area; all the subdorsal and lateral spines, except those of 3 and 4, are canary-yellow with the end half or third black; the supra- and sub-spiracular spines are wholly black; the rest are brown-red. Subdorsal spines of 10, 11 are slightly smaller than the rest. Length 85 mm.; breadth 10 mm.; the head 8 mm. in diameter; length of dorso-lateral spines of 3 and 4: 14 mm.; of subdorsals of all segments: 7 mm.; of supra- and sub-spiracular spines: 6 mm.; of others: only a few millimetres.

Pupa.—Somewhat club-shaped but very broadly, stoutly so, the greatest breadth from shoulders back to 7 whence the diameter decreases gradually to anal end which is hemispherical, the base of hemisphere quite 7 mm. in diameter compared to a maximum body-breadth of 15 mm.; segment 14 is a very flat plate or cap ending the abdominal cone with a row of six small cones; simple and without hooks, transversely across its middle; 13 has a row along hinder margin of some twenty small, laterally-flattened teeth, the two end ones being the smallest; these teeth are like short-oblong cogs standing perpendicular to the surface and are on the front margin of 14 also, tight up against the corresponding ones of hinder margin of 13 and are somewhat round-topped, with the tops grey-velvety; the row of 6 cones of 14 are really well in front of the apex of the cap; the clasper scars show as a lump ventrally of abdomen end, with a longitudinal, central, depressed line; segment 14 ventrally in the female pupa is prolonged triangularly forwards through 13 and the hinder margin of 12 with a small, longitudinally-elongate pit touching the apex of the prolongation; 12 is just under 3 mm. long while 13 is 1 mm.; segment 11 is 4 mm. with the front margin longly and evenly bevilled to the common margin of 10-11, its surface in no way distinguishable from the remainder of the segment-surface; 10 is 5 mm., its hinder margin (the same as those of 8 and 9) more steeply bevilled than front margin of 11, the surface of the bevil rather closely granulate-rough and abruptly limited frontal from rest of segment; 7=8=9 in length and the front bevils of 9, 10 are identical with that of 11; segment 6=12, about 3 mm.; segment 5 is just about half 6 and equal to 4; the thorax is 7 mm.=5+6+7 together, its hinder margin coarsely, smoothly beaded, the beads 18 in number, each side decreasing in size from a subdorsal, large bead and this hinder margin of thorax is an extremely slightly curved line meeting the wings in a very broadly-rounded angle of 120°, its front margin straight, curved forwards on each side slightly to spiracles of 2, its dorsal line very distinctly and coarsely low-carinated, inclined to the longitudinal axis of the body at 75° in front third, this inclination gradually decreasing backwards over 4, 5, 6 to become parallel to axis in 7; segment 2 is 3.5 mm. long, convex both ways, the dorsal line carinated like the thorax, the front margin straight, the whole segment twice as wide as long, the margins meeting in points at spiracles; and it is in a plane at right angles to the axis, quite perpendicular that is. *Head* with vertex in the same plane as 2, narrow between the bases of antennae, the frons nearly ventral, a prominent, narrow strip between eyes, transversely rounded and very deeply divided throughout its length by seven cross-lines; the mandibular pieces are prominent-uneven, rather large between the eyes which are corrugated on front half, rather smooth behind, the two halves divided by a linear, nearly straight, depressed crescent-line; the clypeus is a trapeze-shaped piece with the frons-prominence running on to its proximal half; proboscis reaches middle of wings, the fore legs ending a little beyond one-third length of wings, the mid legs reach two-thirds length of wings; antennae end between fore legs and end of proboscis; the ends of hind legs are visible as a triangular, medially-divided piece between the triangularly-separated apices of wings.

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Surface of wings is shining, the legs, proboscis and its halves and antennae are limited by depressed lines, the veins are just indicated and it is superficially and rather coarsely lined like cracked lacquer; the head as described for eyes and frons; 2 smooth except for dorsal carination; thorax transversely, somewhat-irregularly corrugated; abdomen rather like the thorax but superficially pitted besides, front and hinder margins superficially longitudinally parallel-lined for a short distance, segment 8 with front margin much more prominently similarly lined; segments very distinct, abdominal segments 8 to 11 even constricted at margins; no sign of larval hairs but the spines have left representing scars. *Spiracles* of segment 2 indicated by the hinder margin of 2 being wide-curvedly but shallowly emarginate in front of the slit, the thorax having a corresponding segment of a circle, twice as long as broad on front margin to fit into the emargination of 2, both these very slightly thickened, both thickenings rugose, the transverse length of the arrangement about equal to one of the remaining spiracles which are all very large, velvety fawn-coloured, parallel-sided, round-ended ovals, fully four times as long as broad, the length equalling about half a segment-length (leaving the bevilled margins of 8 to 11 out) long, the margins of the fawn-colour bounded by a thin-raised border that is the colour of pupa and there is an obscure surrounding, flush oval space broader than the spiracle but the same length upon which the whole is placed and a central slit to the fawn-coloured part. *Colour* of pupa nearly black, the surface not very shining. Length 42 mm.; breadth 15 mm. at middle; 9 mm. at 12.

The spiracles, of 2 sometimes show velvet-brown, longly oval in between the roughened surfaces; segments 4, 5 are sometimes obscurely carinated in dorsal line; the pupa is always somewhat swollen in 6, 7 and 8; the ventral line is practically straight.

Habits.—The larvae are generally found high up on trees of Sadagi (*Schleichera trijuga*, Willd.) in the big jungles of the line of the Western Ghats in N. Kanara District; and more particularly in evergreen areas. They lie on the undersides of leaves, eating the mature ones, hiding in the thicker bunches. I have discovered the majority of them after the first introduction, by the presence of droppings on road-surfaces but, finally, did a day or two of systematic hunting and got a satisfactory number. The first specimen was brought in many years ago by one of my servants who fetched it down with a stone from the very top of a high tree, a really good shot. Needless to say he was more or less a boy. The caterpillar was badly damaged and of course died; but the introduction had been effective and all the more exciting because the larva is of a very unusual type and a fine thing to look at. We christened it the Yellow Peril. The larva descends to the ground to pupate well below the surface of the soil in an earthen cell, smoothed on the inside but unlined with silk. The pupa is not fixed in any way inside. Five larvae went down in October and the first imago emerged in the month of June of the following year. Larvae are to be found every year from July to January of the next. I was first introduced to it in 1900; got the first larvae in 1906 and bred moths from that date to 1910. I wrote the first description of the larva on 8-11-1906 and the pupa on 19-12-1907. I have never seen a wild moth and the species usually must be very rare. It occurs in N. China, Khasis, Malacca, Celebes, and, now, in the Western Ghats, Bombay in the N. Kanara District.

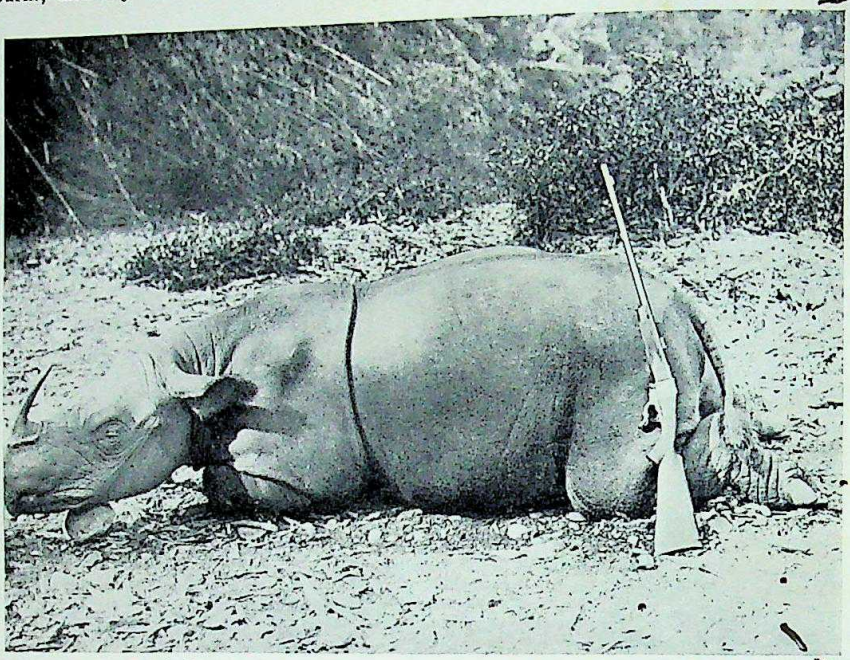
The food tree is a common deciduous species in the Kanara jungles, occurring at all heights from sea level up and is perhaps commoner in the area covered by deciduous forest than in evergreen ones. Its Kanarese name is Sadagi but it is more widely known by the Mahratti name of Kusumb or Kosamb. It is also known as the Ceylon Oak according to Talbot and has been called the Travellers' Friend because it is one of the very first to break out into new leaf in March at the beginning of the hot weather. It then is a conspicuous object amongst its leafless companions owing to the young leaves being bright red, varying from delicate pink to nearly blood-colour and from occurring in small groups on nearly all hillsides (also on the flat and along the roads). The foliage finally all becomes green. An essential oil is obtained from the seeds and is the basis of the well known 'Macassar' hair-oil. The timber is hard, so hard that woodcutters object to felling the tree; which does not, however, prevent villagers from exploiting it to make sugar-cane mills with.

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Asiatic two-horned Rhinoceros (*R. sumatrensis* Cuv.).



The author's best Asiatic two-horned Rhinoceros (*R. sumatrensis* Cuv.).

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RHINOCEROS SHOOTING IN BURMA.

BY

W. S. THOM.

(*With one plate*).

Two species of rhinoceros, the Sumatran or double-horned rhinoceros (*Rhinoceros sumatrensis*) and the Javan or single-horned rhinoceros (*Rhinoceros sondaicus*) are said to exist in Burma. *R. sumatrensis* is the smallest known living rhinoceros and the most hairy, whilst its height seldom, if ever, exceeds 4 ft. 8 or 10 in. at the shoulder.

THE JAVAN RHINOCEROS (*R. sondaicus*).

I have shot several *R. sumatrensis* during my wanderings in Burma, but have never come across *R. sondaicus*, nor have I ever met anyone in Burma who had ever shot one. In fact, until a few weeks ago, I was under the impression that this animal had been long since exterminated and that it was not to be found anywhere in Burma at the present time. It seems, however, that I am wrong. We know, however, that it has recently been obtained in Sumatra where it apparently exists in fair numbers. It was formerly thought that only a few specimens existed in Java and the Malay Peninsula, and possibly in parts of Siam and Burma. This species was, however, originally described from Sumatra, but it has been a matter of doubt whether it still existed in the island.

Mr. G. C. Shortridge in an article entitled 'The Asiatic two-horned Rhinoceros (*R. sumatrensis*)' in the Society's *Journal*, vol. xxiii, No 4, p. 772, dated 25th May 1915, says, 'Besides the rhinoceros I shot (which was an example of *R. sumatrensis*), I have only heard of two other instances of a Rhinoceros being shot near Victoria Point by a European, one of these specimens, of which I have seen the skull, was *sondaicus* obtained some years ago by Captain McCormick, a former planter in the district, etc.' Mr. Shortridge says nothing more about *R. sondaicus*. As Mr. Shortridge was collecting for the Bombay Natural History Society, I take it he is an authority and knew what he was talking about when he identified the skull of the animal shot by Capt. McCormick as belonging to *R. sondaicus*.

Mr. E. H. Peacock, District Conservator of Forests and Game Warden, Burma (retired), in his book, *A Game Book for Burma and Adjoining Territories*, published in 1933, states that the height of a mature specimen of the Javan rhinoceros (*R. sondaicus*) is probably about 5 ft. 6 in. or roughly a foot higher than the Sumatran rhinoceros. Mr. Peacock says, "The best-known grounds used to be the forests of the Victoria Point Subdivision in Mergui District.* * * In this Subdivision the Javan rhinoceros was reported by all local hunters and guides to frequent heavy

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evergreen forests on flat or comparatively flat ground. It was supposed never to ascend high into the hills: i.e., into the typical habitat of the Sumatran rhinoceros.

"The forests of Victoria Subdivision undoubtedly held, at one time, a very fair number of Javan rhinoceros, but these have long since been poached out of existence for the sake of the valuable horn and blood which to realize an even greater price than that of the Sumatran rhinoceros.

"There are said to be four specimens of the Javan rhinoceros existing in the Kahilu Game Sanctuary in the Thaton and Salween Forest Divisions. Indeed, this Sanctuary was established mainly for their protection. These specimens are reputed to ascend hills in the manner of the Sumatran rhinoceros and, since they appear never to have been seen by any reliable authority, it is somewhat doubtful whether they are actually Javan rhinoceros or not." The fact that *R. sondaicus* does exist in the Sanctuary has however been since confirmed. Through the courtesy of Mr. S. F. Hopwood, Chief Conservator of Forests, Rangoon, Burma, and Mr. F. Allsop, Assistant Conservator of Forests, I have received an interesting letter dated 15th February 1935. Mr. Allsop writes that there is no doubt whatever that the rhinoceros inhabiting that area are *R. sondaicus*, Mr. Allsop spent about three weeks in the Kahilu Sanctuary and had the luck of actually seeing one rhinoceros at a distance of about 50 yards. It was in thick vegetation, but he was able to see the animal sufficiently clearly to say that it carried one horn about 9 in. long, set back slightly from the tip of the snout and that it was about 4 ft. 9 in. to 5 ft. at the shoulder. Mr. Allsop adds, that on two occasions within recent years, the dead bodies of female rhinoceros have been found in the Kahilu Sanctuary and that one was definitely identified by the Bombay Natural History Society as *R. sondaicus*. The skeleton of the second one was under examination at the time Mr. Allsop wrote and he has not been informed yet of the result to date i.e. 15th February 1935. Mr. Allsop has come to the conclusion from the tracks he has seen in the reserve that there were not less than six rhinoceros in the area in question, five being adults and one a calf.

Mr. Allsop has concluded from his own observations that the favourite foods of these animals are:—

(1) Leaves and stems of 'Suyit', *Acacia* sp. probably *A. pennata*, a climber.

(2) Leaves, stems and fruit of *Zizyphus glabra*, a thorny climber.

(3) Leaves and stems of *Cenocephalus suaveolens*.

(4) Leaves and twigs of *Trema orientalis* a very soft wooded tree common in secondary growth after shifting cultivation.

(5) Fruit of *Dillenia indica* (Bur.: thabyu).

Bamboos and grasses are eaten only to a very small extent, if at all. In addition to the food plants recorded above the same keeper of the Sanctuary states that the animals eat *Cudrenia pubescens*, *C. javanicus* (Bur: Sinswe Su), *Ficus pomifera* (Bur.: Kaaung), *F. hispida* (Bur.: Kadut), *F. hirta*, *Mallotus albus* (Bur:

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Petwaing), *Erythrina lithosperma* (Bur.: Kathit) and *Homonoia riparia* (Bur.: Momaka).

Mr. Allsop in his letter goes on to say that there are a number of wallows many of them of long standing and that they are situated near the sources of permanent and semipermanent streams in the evergreen forest. The animals seem to visit them somewhat irregularly and capriciously. They appear to prefer to wallow fairly early in the morning, i.e., between 6 and 8 a.m. not in the heat of the day. The fragmentary evidence Mr. Allsop was able to collect indicates that they do not wallow daily but only once in three or four days and that individual wallows fall into disfavour and go out of use for a year or two at a time and are reopened later. No large deposits of dung were noticed, the rhinoceros evacuating almost anywhere with a slight preference for the pools of small streams. They do not return to the same place time after time as some species of rhinoceros are said to do. In view of the statements made by Mr. Shortridge and Mr. Allsop, and the definite identification of a skull by the Bombay Natural History Society there is no alternative but to accept the evidence that *R. sondaicus* does exist in Burma.

Sumatran or Two-Horned Rhinoceros (*R. sumatrensis*).

My experience of the Sumatran rhinoceros over a great number of years, during which I have, I suppose, seen quite fifteen or twenty of these animals at close quarters, has been that they are as active as goats and are really expert hill climbers. They will even negotiate country that neither bison nor elephant could possibly surmount. I have also found them on hills up to 4,500 ft. The Sumatran rhinoceros, although the hills are his proper habitat, occasionally descends to flat country especially towards the end of the rains, and remains there sometimes for long periods, till January and February, when there is still plenty of cover and mud and water to be met with everywhere. By March, as a rule, they are all back in high evergreen forests again. It is very rarely seen in the plains, so far as Arakan is concerned, during the hot weather months i.e. from March to June. Like pigs they sometimes wander about aimlessly for miles. I knew of one animal that descended from the hills and ravaged for several nights in succession a sugar cane plantation situated on the banks of the Kaladan River in Arakan between the Kyauktaw and Kaladan police posts. This happened during October, November and December, when the jungles are denser and damper than at any other time. It was often seen bathing in the Kaladan River by moonlight, by the people going up and down the river in dugouts.

Mr. Shortridge, in the same article referred to above, is mistaken in saying that *R. sumatrensis* 'apparently do not care for clear running streams and are said only to visit the low ground during the hot season when their drinking pools in the hills have dried up'. As a matter of fact, I have found *R. sumatrensis* at the top of the steepest of hills frequently drinking and wallowing in clear hill streams year in and year out at elevations varying

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from 1,500-3,000 ft. with not a vestige of mud or muddy water to be found for miles around except on low ground at the foot of the hills near permanent streams. The majority of the clear water hill streams in the Arakan Hill Tracts never seem to dry up.

I would state here once more that for such a clumsy looking animal, the Sumatran rhinoceros is an extremely active animal and a wonderful hill climber. On numerous occasions, when following their tracks I have had to hand over my rifle to a follower and climb up hand over hand steep banks that a Sumatran rhinoceros had ascended. Their tracks in the hills are generally most difficult to follow, especially when the ground is hard, or when it is covered with a thick layer of dead bamboo leaves. Should tracking be interrupted by a heavy shower of rain the bamboo leaves swell out, then the front or centre toenail impressions of the forefeet, which are usually the only marks that are visible on the ground are invariably almost obliterated. All rhinoceros have three toes on the fore and hind feet, unlike the Tapir (*Tapirus indicus*) which has four toes on the front and three on the hind feet.

Of all the wild animals in Burma I should say that the rhinoceros, the tapir and the takin, avoid the presence of man most and are therefore usually found further from villages than any other animal. I understand, however, that in the Kahilu Reserve rhinoceros have been feeding on chillies cultivated by the villagers. There is also the instance of *R. sumatrensis* which was found in Arakan in a sugar cane plantation situated on the banks of the Kaladan River not far from a village. There are always exceptions in every case for there can be no doubt that a rhinoceros is a very shy animal and usually avoids man. The rhinoceros's senses of sight and hearing are very poor, but its sense of smell is very acute. A rhinoceros once it has been disturbed is very difficult to come up with again unless it enters one of the mud wallows or swampy depressions. These wallows are frequented at odd times but especially during the hot weather months from March to June, when the gad or horseflies worry fourfooted animals most. I have watched herds of *Tsaing* (*Bibos banteng birmanicus* Lyd.) trotting along through the jungle during the heat of the day, as if the devil was at their heels, surrounded by clouds of gad flies and shaking their heads from side to side and snorting in their efforts to shake off their relentless tormentors. Most wild animals especially bison and tiger endeavour to lie up in the thickest cover they can find during the heat of the day in order to escape being bitten by these flies whose bites draw blood and cause intense irritation. Rhinoceros do not usually lie up during the day in very dense jungle. *R. sumatrensis* may be found lying asleep during the day either in a mud wallow, or at the foot of some shady tree or bamboo clump in fairly open jungle on top of some ridge, or hill, where he may catch any breeze that may be blowing. Most animals, especially bison, sambar and even elephant, like lying up for the day during the hot weather on some ridge to take advantage of the breeze during the heat of the day. I have, however, found old solitary bull bison, tsaing, elephant and even rhinoceros, seek the densest cover they could find, when their enemy—man—

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had been hunting them persistently. The Sumatran Rhinoceros very seldom deposits its dung in the same spot daily. As a matter of fact, they seem to me to only do so when they accidentally cut across their own tracks at a spot where they have previously evacuated. The odour of the droppings, even though not their own, seems to attract the animal's attention and causes it to halt and evacuate on the same spot. It is not a regular habit. *R. sumatrensis* evacuate, sometimes when crossing a stream as do horses and elephants. *R. sumatrensis* change their feeding grounds generally once every ten or fifteen days. Sometimes, if the locality is a quiet one, far from the haunts of man and there are plenty of shrubs for them to browse upon, they remain in one place for nearly a month. I found that they generally fed along steep, well wooded valleys and also along the steep banks of well wooded mountain streams. The majority of these streams, so far as the Arakan Hill Tracts District is concerned, are full of rocks, high waterfalls and dense bamboo and cane jungle. In these rocky hill tracts there are no wallows. I noticed, however, that the animals in such places invariably had their baths in natural pools at the foot of waterfalls. Fine gravel and stones form the beds of these pools but there is no mud whilst there is usually about two or three feet of water in them. When feeding near these mountain torrents Rhinoceros just bathe, where it suits them, i.e., where there is sufficient water to cover their bodies when they roll about in it. The approaches to these mountain pools are very steep and inaccessible. The climbing one has to do when hunting these animals in these places, is really prodigious. One had often to make long detours to get round a succession of precipitous waterfalls, as it was quite impossible to ascend or descend most of the beds of the streams. We invariably carried about 50 yards of stout rope to enable us to surmount these waterfalls and steep ascents. One had also to be in the pink of condition to be able to keep going all day over the most trying country to be found anywhere in the world. These remarks apply more particularly to all the ranges of hills which skirt the Ru, the Lemro and the Peng Rivers in Arakan, where Sumatran rhinoceros are still fairly plentiful and which tracts of country ought, in my opinion, to be entirely reserved as sanctuaries by the Forest Department. The Ru stream is already a reserve, if I mistake not. The only other part of Burma where I found the Sumatran rhinoceros fairly plentiful was in the Yoma range of hills along either side of the watershed running between Arakan and the Thayetmyo District, inland from Kama and Mindon. They were also common along the Shwe-U-Taung range of hills in the Momeik State of the Ruby Mines District, but neither in the hills between Arakan and Thayetmyo or in the Shwe-U-Taung range did I find these animals in such inaccessible places as I found them in Arakan, especially in the steep hills which skirt the Peng and Lemro Rivers near Pengwa. I suppose they had been hunted so persistently and ruthlessly in Arakan by the hill tribes that they were finally driven to occupy these inaccessible places. When I was shooting along the watershed between Arakan and Burma, I noticed that *R. suma-*

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trensis invariably made their wallows at the source of streams and in springs as near the top of the watershed as possible. Discarded wallows at lower elevations dry during the hot weather and are used again during the rains. An *R. sumatrensis* may have half a dozen or more wallows which it knows of and which it visits at odd times according to their dry or wet condition but it does not necessarily have a daily mud bath. These wallows are often enlarged by pigs as well as by elephants. A rhinoceros like a pig and a buffalo must have his bath, be it of mud, or of water. I have seen elephants also rolling about in the mud of a wallow to give their bodies a coating of it so as to protect their sensitive skins from the bites of flies and mosquitoes. Rhinoceros in the parts of the country about the Peng and Lemro Rivers often fed on anything green they could get. They must have been hard put to it at times to get anything really succulent to feed upon at all in these steep inhospitable bamboo clad hills. Except for an occasional small patch here and there, all evergreen forest seems to have been destroyed for cultivation purposes by the hill people by their wasteful system of felling timber and burning it. If it were not that the bamboo is a strong healthy shrub there would soon be none left either. Nothing for miles around can be seen but the *Kayinwa* bamboo (*Melocanna bambusoides*). *R. sumatrensis*, like most herbivorous animals, is very fond of the flower and fruit of this bamboo. This bamboo, as is well known, flowers and fruits once in thirty or forty years and then dies. I have seen thousands and thousands of acres of this bamboo laid waste at flowering. Nearly every junglecock for miles around seems to congregate in these areas when the seedlike flowers are on the stems or falling on the ground. There is also a kind of caterpillar at that time on the stems which seems to attract bird life to these areas.

The extraordinary thing is that there were no hens visible, only cocks. Either the caterpillars or the cornlike flowers of the bamboo, or both give them food. Many animals also gathered in these flowering patches of bamboo to gorge on the pearshaped fruit. I have known of village cattle gorging themselves on the fruit to such an extent as to die subsequently from the effects of overeating. After the bamboos wither and die, animal life disperses bamboo and there is an emigration of hordes of field rats. Where the bamboo has flowered and died wild plantain *Musa textilis* spring up everywhere in its place for acres and acres. Where does the seed of this plant come from? Has it been lying dormant all these years? Once the bamboo fruit takes root and springs up again the *Musa textilis* disappears. The strange thing is that this phenomenon is generally followed by epidemics of smallpox, or cholera, especially amongst the hill people. They are deprived at the same time of their food supplies in the tender bamboo shoots and are also unable, owing to the scarcity of bamboos, to make dah handles and mats or rebuild their houses which are usually constructed of bamboo. I could write more on this interesting subject but we are talking about rhinoceros, not bamboos.

R. sumatrensis also feeds on a kind of long, feathery looking

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grass called *pyaung-sa* or *kyan-sa*, bamboo leaves and shoots, prickly shrubs and creepers and the leaves of several species of plants with reddish coloured soft hairy leaves and stems found in certain localities in the hills or in the valleys and along the banks of streams. I am afraid I am not a botanist like Mr. Allsop so cannot give any botanical names.

Rhinoceros are generally found feeding very early in the morning and after sunset, and like the Tapir (*Tapirus indicus*), are more or less nocturnal in their habits. A rhinoceros is just like a big pig. He wanders about everywhere, north, south, east and west, as the spirit moves him. Once he has been disturbed or decides to change his feeding grounds, it is almost impossible to overhaul him. He travels at a quick walk for miles over the most abominable country imaginable until he reaches the desired spot. These animals could be easily run down and brought to a standstill with dogs as, in the hot weather, they do not stay very well once you have got them on the run; they invariably pull up every mile or so. I have never used dogs for this purpose of course, but I have almost been able to run down a rhinoceros on foot by keeping steadily on after him at the double mile after mile. It was hard work, but in those days I was as hard as nails and could stay for ever. When rhinoceros are hard pressed and thoroughly alarmed I have heard them utter loud whistling braying sounds in different keys, not unlike the braying of a donkey. At other times when I have followed and come up with an animal, it usually uttered a terrific snort not unlike that uttered by a large boar or gaur (*Bibos gaurus*) before galloping off after being disturbed. Rhinoceros also make a peculiar humming or buzzing sound when submerged in their wallows, especially when they have been chased or are tired and have just finished a long journey. It is partly a sign of exhaustion and partly a sign of satisfaction at being immersed in cool mud and water.

The carcase of a Sumatran rhinoceros is worth, to a Chinaman or Burman, nothing under a thousand rupees. The blood especially, if drawn straight from the heart, is valuable. It is dried slowly in bamboos over a fire and sold for almost its weight in gold. The horn again is more valuable than the blood as it is ground down, mixed with other drugs and used as an aphrodisiac and as a sovereign remedy for all sorts of ills. The Javan and Sumatran rhinoceros are considered of particular value for medical purposes by the Chinese and Burmese. The Chinese seem to know more than any other race about the uses to which the blood and horn of a rhinoceros can be put to. Fortunately the Burma Government have prohibited the shooting of rhinoceros in Burma altogether. There is no doubt that these animals are being slowly and secretly exterminated in the hills of Arakan by the wild tribes who come up and spear them in their wallows during the heat of the day. No one can tell what goes on in the Thayetmyo Yoma hills between Arakan and Burma as the Forest Department are under-staffed, but the sooner some one is sent to keep an eye on the rhinoceros in the Arakan Hill Tracts the better.

Burmans can distinguish, as can any sportsman of experience,

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between a male and a female rhinoceros when following their tracks by noticing the way the young saplings, creepers or the branches of bushes have been twisted by the animal's horns as it moves along when feeding. A female or male with a short horn, according to the Burmese hunters, cannot do any twisting of branches, twigs and creepers. The more twisted the creepers, bamboos and branches appear, the better the chances of coming across an animal with a good horn. Another way of distinguishing the tracks of a female and male, there being very little difference in their size and appearance, is by carefully noting the positions of their droppings or dung. In the case of a male the ordure and urine will be found on the ground ex.ded one behind the other, a foot or two apart, whereas in the ca. of a female they will be found more or less together, or scattered over the bushes in the immediate vicinity at heights of from three to four feet. The urine of a female as seen by me on several occasions was of a pale pinkish colour. The male rhinoceros, when twisting bamboos, young saplings, and creepers, with his horns does so with the object of either cleaning or sharpening them or simply because of the pleasing sensation gained by the scratching. Perhaps it may be done as a challenge or from pure cussedness or sheer *joie de vivre*. Bison and tsaing and ordinary domestic cattle often tear up the ground with their hoofs and horns or rub them on the branches of trees or saplings for no apparent reason as do deer occasionally even when they have no velvet to get rid of, simply I take it, because the rubbing sensation pleases them. It may be of course a sex desire. Burman hunters have often told me that all big game are more restless, on the *qui vive*, and more truculent when the moon is on the increase and nearly full. Many races in India believe that a man is at his best when the moon is fullest.

One rarely comes across a young rhinoceros. During the 49 years I have been in Burma I have never seen either a young rhinoceros or the tracks of one. Burmese hunters say that rhinoceros bends its head to clear its path of obstructing jungle and heaves dead logs etc., over its back as it proceeds. These fall on the youngster following on the heels of its mother, and so kill or maim it. Hence the scarcity of young. This of course is a myth and can hardly be accepted as a true reason. I referred to this subject in the *Indian Field* sporting paper of September 30, 1909, in a long article entitled 'Notes on the Tapir (*Tapirus indicus*) and Rhinoceros (*Rhinoceros sumatrensis*).' The *Indian Field* became defunct a number of years ago. The real reason perhaps why rhinoceros are so scarce is because they have been so systematically and relentlessly hunted now for years past in all parts of the country where they eixst. The people are also well aware of the great value of the animal's blood and horns. The result is that the males are shot more frequently for the sake of their horns than the females which have small inferior horns, and as rhinoceros were never prolific breeders at any time, their chances of producing young ones are considerably lessened in consequence.

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Rhinoceros get to their feet when disturbed and dash away at a much greater speed than would appear to be possible for such a heavy, clumsy looking animal. With a few exceptions, they, like all the other jungle animals of India and Burma, periodically visit salt licks where the earth and the water are slightly impregnated with salt or potash. The reason for these visits does not appear to have been much commented on by sportsmen generally in any country, for these salt deposits, or animal health resorts are to be found in every country in the world as well as in India and Burma. From an inspection of the tracks leading to and from some of these salt licks there can be no doubt that they are more often visited by the deer tribe than by any other quadruped. In fact these animals seem to visit the licks almost daily. The elephant, gaur or bison (*Bibos gaurus*), and 'tsaing' or banteng (*Bibos banteng birmanicus*) come next, in the order named with a visit, of perhaps once or twice a week. Then comes the rhinoceros and the tapir with only one or at the most two visits a month. The moon seems to have a lot to do with these visits in the case of the tapir and the rhinoceros for they seem to come at full moon, and at the appearance of the new moon. There are regular beaten tracks leading to nearly all the most frequented salt licks and I have seen these pathways literally churned up into a sea of mud by the hooves of animals coming and going. It should be noted, however, that these salt licks are only popular at certain times of the year. There is a regular season when animals partake more freely of the brackish earth and saline water, while at other times there is a regular falling off in the number of visits paid by all the larger animals such as elephant, rhinoceros, tapir, gaur and tsaing. More visits are apparently paid to such licks between the months of December and June than at any other period. Some salt licks, which are more highly impregnated with salt deposits than others and which are situated in the heart of the jungle far from the haunts of man, are naturally frequented more often than those situated near villages and cultivation. During the monsoon, from July to October, most of the salt licks become inundated with water and then the earth no doubt loses to a considerable extent, its saline properties and is consequently less palatable.

I am of opinion that animals partake of saline mud and water as an aperient when they wish to free their systems of parasitic worms which are found in the stomachs of both bird and beast the world over, and which, if not expelled before they multiply to any great extent cause great trouble and are also the means of disease breaking out amongst them. On more than one occasion I have observed these parasites among the droppings of elephants which have eaten the saline earth at these deposits. The large quantities of earth which an elephant will put away at one visit is simply astonishing. I once watched, at a distance of only about ten paces, an old tusker elephant pick up and shove down his throat with his trunk, a quantity of this saline earth weighing quite thirty to thirty-five pounds before departing to drink at a neighbouring stream. At some salt licks only the water is drunk out

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of pools which are sufficiently impregnated with saline matter. None of the cat tribe, i.e., tigers, leopards or cats, ever partake of the waters or eat the earth at a salt lick. Bears and pigs also do not visit salt licks. I have however, seen jungle fowl, pheasant and imperial, as well as green pigeon, and also the gibbon monkey sipping water at a saline pool. There is some mysterious fascination about a salt lick that seems to attract animals and birds to it whether they do or do not partake of the waters or salt earth there. Tiger and leopard of course prowl round salt licks on the chance of killing an animal for food.

Sitting up at a salt lick in India or Burma with or without electric contrivances is now strictly forbidden.

A rifle of any of the following calibres is good enough for use upon the Burmese rhinoceros viz. 500, 470, 450, 423 and 12 bore Magnum Explora ball and shot guns. I am of opinion that *R. sumatrensis* are not given to charging even when wounded.

My first experience with the Sumatran rhinoceros, was on the Shwe-U-Taung range of hills between the state of Momeik and the Ruby Mines District of Upper Burma. My hunters and I had struck the tracks of a Sumatran rhinoceros one morning at about 8 a.m. I was armed with a 12 bore hammerless ejector 'Paradox' gun firing a cordite charge and heavy conical bullets. With this weapon in one hand I could, if necessary, sprint several hundred yards after an animal without getting blown. My second weapon, which was meant to act as a stopper in case I should be charged by, say, an elephant or a bison, was an 8 bore rifle burning a charge of 10 drs. of black powder with heavy conical bullets of hardened lead. At 3 p.m., after we had taken many twists and turns through bamboo jungle and tree forests, up and down very steep hills full of giant stinging nettles, my best tracker, Maung Pe, suddenly turned round to me and pointing to some mud smears on the leaves and stems of the surrounding bushes whispered 'Sir, we are not far from a rhinoceros wallow—please keep a careful lookout ahead'.

After striking a match and blowing it out to see which way the smoke travelled, whether the wind was in our favour or not, I took the lead, and after travelling a matter of about 50 yds. or so and going round the base of a large ant hill surrounded by some low bushes, I suddenly heard a splash ahead and found myself within ten yards of a rhinoceros that had risen out of his wallow and was sitting on his hind quarters looking in our direction. Firing both barrels into his head in quick succession I sprang to one side in case he should charge along the path by which I had come. On receiving my shots, he dashed out of the wallow at a great pace, uttering a loud snort, the noises emitted by his feet as he withdrew them from the thick mud sounded like the withdrawing of corks from large champagne bottles. Thinking I had missed him altogether for he never flinched or showed any signs of having been hit, we followed on. After travelling 20 or 30 yds., blood was discovered on either side of his tracks which was a clear indication that one of my bullets had found its mark but, evidently without touching the brain. After going about a

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quarter of a mile we came upon him lying down breathing stertorously. I then let him have a right and left with the Paradox as he faced us. I then saw that only one of my bullets had passed through his head. The anterior horn was small—being only about 12 in. in length, whilst the posterior was a mere horny protuberance (see Pl. upper photo). The animal was then cut up and the meat smoked over a large fire being subsequently divided among my men. I found the meat, if properly cooked, quite palatable. It was as good as beef at any rate if not better. It should be mentioned that not a scrap of any animal shot by me has ever been wasted. If my servants, camp followers and coolies did not consume it, villagers from the nearest village usually flocked in and scrambled for the remnants. The entrails, and even the bones and skin were taken away.

On another occasion, in the Ruby Mines District of Upper Burma, my hunter and I were tracking up a solitary tusker elephant which, judging by the measurement of its fore-feet impressions which taped 20 in. from toe to heel, indicated that the weight of ivory carried by the animal must have been in the neighbourhood of 70 or 80 pounds the pair. Unfortunately when we were about a mile to the rear of the animal it walked into a camp of Burmans who were engaged in cutting bamboos, and, after demolishing their huts and nearly catching one or two of the occupants had gone clean away. However, these bamboo cutters gave us the information that they had that morning seen—it was then only about 8 a.m.—the tracks of two rhinoceros which seemed to be travelling together. This was good news and it did not take us long to pick up their trail, and, finally, after following them for some time I suddenly caught sight of them entering a huge mud wallow in the side of a hill. One of the animals must have got a slant of our wind for he suddenly slewed round and cleared out of the wallow at a fast trot. The other, however, after staring about him stupidly for a minute or so, trotted in our direction. I waited till he came abreast of me, and at a distance of about 30 yds., I let him have a shot from the 8 bore. This did not stop him. He seemed to travel faster, if anything. We took up the tracks but could get no sign of blood. 'A clean miss, Sir, I am afraid', said Maung Pe. 'How could you have missed such an easy shot?' There was no doubt about it. I had clearly missed and there was no more to be said about it. I had no excuse to offer except to remark to him that even the most expert marksman occasionally misses. However, we took up the tracks again. It was a long stern chase. The time was about 10-30 a.m. We travelled all day on those tracks until rhinoceros tracks, stones, earth, bamboo clumps, bushes and trees seem to have been indelibly, photographed on the brain and in the retina of my eye. At about 5-30 p.m. I heard a peculiar, deep humming or buzzing sound, akin to the noise of wind passing through the feathers of the Great Hornbill (*Dichoceros bicornis*) as it beats through the air. 'The sound we have just heard', said Maung Pe, 'was made by a tired rhinoceros blowing or breathing in his wallow. There is, no doubt about it. I have heard it too often to be mistaken now.'

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Accordingly we pushed on cautiously and in less than 5 minutes we were at another wallow. So close was I standing to the mud hole that I could have easily inserted a ten foot bamboo into the mud beneath me. I could see a heaving mass of mud but could not make out which end was the animal's head and which the tail. Only a little bit of the yellow looking clay covered skin of its body was visible. This seems incredible, but is perfectly true nevertheless. As I was certain there was no possibility of my missing this time, I fired the right barrel of the 12 bore Paradox into what I took to be the centre of the body, it being impossible for me to tell where the animal's head lay, so deeply was it embedded in the mud. On the report it rose out of the mud, and, after spinning rapidly round in circles for a few seconds, dashed out of the wallow, making loud popping sounds with its feet as it pulled them from the mud. I knew there could be no mistake this time and that it was hit. It only travelled a distance of about 500 yards and when I came up with it, it uttered a long drawn out scream and expired. This animal I am sorry to say turned out to be a female. She had a mere stump of a horn.

On examination, I found that my bullet had passed through her lungs. According to Maung Pe, she was the same animal I had fired at that morning, as we found the graze of a bullet on her withers, which had cut the skin but had not drawn any appreciable amount of blood. I must say that her dying scream caused me remorse.

I shot my best *Rhinoceros sumatrensis* (see Pl. lower photo) on a range of hills bordering the Lemro River in Arakan at an elevation of about 3,000 ft. I was travelling up the Lemro River in dugout canoes to visit and inspect an out of the way police outpost situated at a place called Pengwa. A weird looking wild man of the woods from a neighbouring Chin village visited my camp on the river and informed me that he knew of a small pond or pool of water on the top of the range of hills above us which used to be visited frequently by rhinoceros in bygone years.

Next morning we started off at daylight for the top of the range of hills hoping that we might have the luck to come across a rhinoceros with a really good horn. I had been told that the part of the country we were about to visit had not been shot over by any Europeans or even local hunters for many years. I found the going steep enough in all conscience and I was soon bathed in perspiration. The men all carried small muslin bags or pads some five inches square, full of wet powdered tobacco, and whenever a leech got on to their legs they just squeezed a few drops of the juice on to it which immediately caused it to curl up and drop off. Salt or gunpowder is equally efficacious.

We reached the top of the hill at about 1-30 p.m. when down came a heavy shower of rain which drenched us all to the skin. This made things rather unpleasant, for the leeches gathered round us in battalions and attacked *en masse*. At about 3-30 p.m. after much wandering about in our efforts to find the rhinoceros's wallow I caught a glimpse of a small sheet of water through the bamboos. I at once took the lead armed with a single Westley.

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Richards 500 bore cordite rifle which burnt a charge of 80 grains of cordite.

My guide, the wild man of the woods, then whispered to me that the rain was bound to bring a rhinoceros to the wallow as the sun was shining brightly whilst it was hot, and the gadflies were in evidence everywhere. To cut a long story short I crept to the pool along an elephant path, and sure enough saw, not only a doublehorned Sumatran rhinoceros with a fine posterior horn but also a very fine bull elephant with a very good pair of tusks. The latter was throwing mud and water backwards over his body and between his fore legs to cool himself and to drive away the gadflies. The rhinoceros was standing alongside the pool within ten yards of the elephant which seemed to take absolutely no notice of its presence. A cock silver pheasant (*Gennaeus lineatus*) was also standing beside the pool between the two animals. I could not shoot both the animals, and as the rhinoceros was the bigger prize of the two, I decided to bag it if I could. As the rhinoceros was standing almost broadside on to me with its head turned slightly away, I moved forward to my right to obtain a better position and also to get slightly nearer. We were now only about 25 yards apart and I wanted to be able to deliver a raking shot from a little behind. What would I not have given to have had a camera at that moment? I should have been able to obtain an excellent shot of both animals on the same plate. However, I waited no longer and let the rhinoceros have a raking shot through the small of the ribs in the hope that it would find the lungs if not the heart, hoping at the same time that the elephant would clear out in the opposite direction and not worry us as I did not want to shoot the animal. The rhinoceros lurched forward on receiving the shot and swung quickly round in my direction with his head in the air. Having got my wind, the breeze having veered round, he charged through the pool very quickly, but whether it was an intentional charge or not, I am unable to say. The elephant on hearing the report banged his trunk once on the ground, and after uttering a shrill trumpet, went off in full flight through the bamboos and jungle making a devil of a noise. I had by now taken up a position some fifteen paces from the pool and as the rhinoceros reached the edge of the water on my side, I dropped him with a broken shoulder, and finished him off with a third shot. He had a very fair anterior horn of a length of about 16½ in. The posterior horn was only from about 2½ to 3 in. long. After disembowelling the animal in order to save the meat for my men, the next day, and taking some photographs of it and the pool, as well as several of it being skinned, we hurried back to camp which was reached in inky darkness at about 9 p.m., after a desperate scramble through the jungle and undergrowth, the leeches crawling all over us *en route*. One of my men had a leech in either nostril, whilst another had one fixed on the white of one eye ball. The man with the leeches in his nostrils was able finally to pass them out into his mouth when they had become sufficiently gorged with blood. I had a similar experience some years before, so was able to explain to him how to eject the leeches. There is in fact no

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pain but only a slight itchy feeling in the nose, and the only thing to do is to wait until the leech has gorged itself with blood and then to pass it out through the nasal passage into the mouth in the usual way from whence of course it should be ejected at once. It sounds horrible, but necessity knows no law, and this method is sheer necessity. In the case of a dog getting a leech up its nose the only thing to do is to hold a bowl of water under the nose of the animal till the leech longing to reach the water hangs low enough down to enable it to be seized with a pair of pincers or a piece of cloth and pulled out. A solution of salt water can also be injected into the nose. Some people recommend tobacco juice but this may affect the brain or the eyesight and is unsafe.

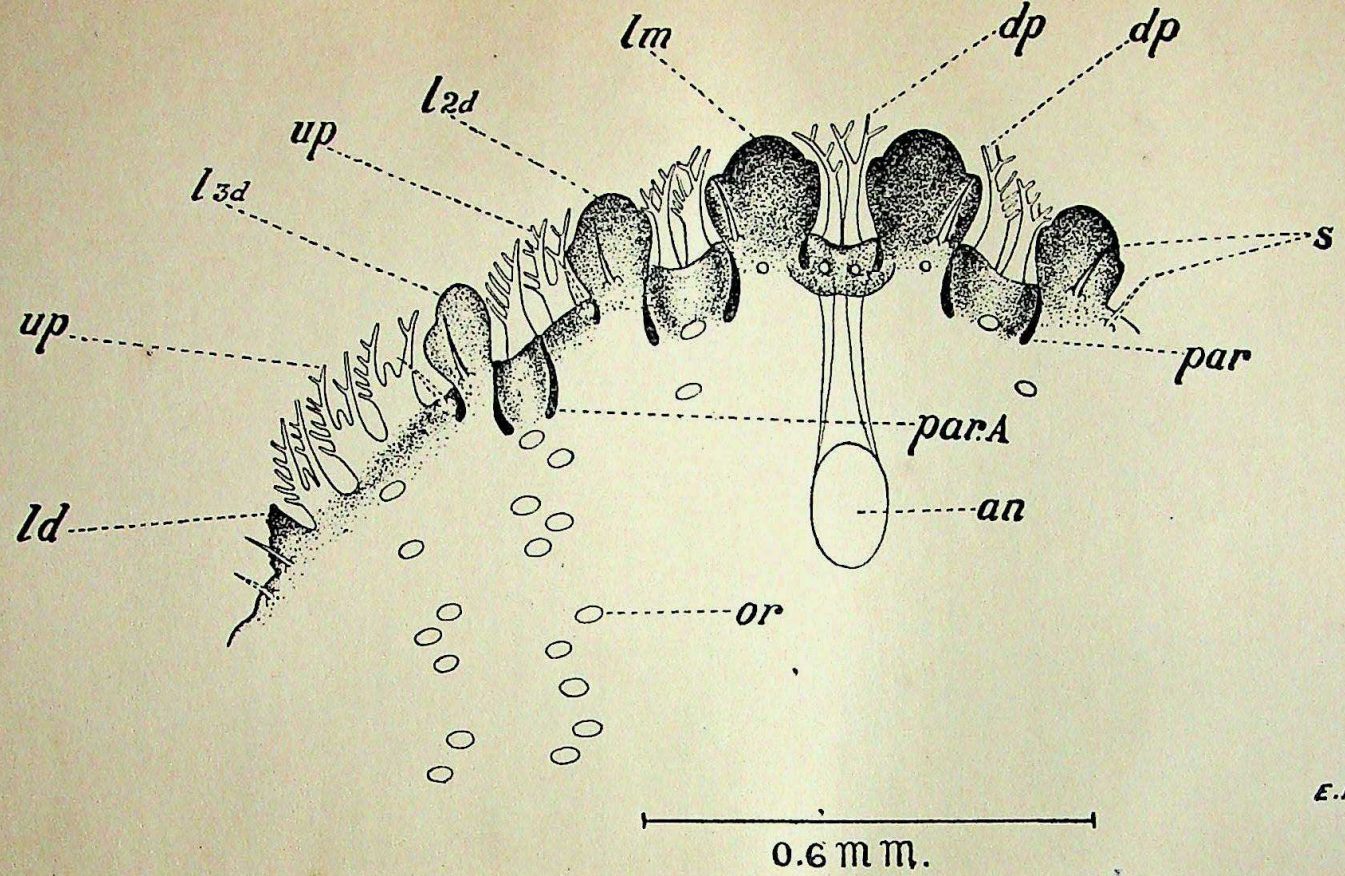
With regard to my shooting kit, I wore as footgear the brown canvas and rubber hood 'Workshu' with two pairs of socks, and shorts and coat made of green coloured shikar cloth. The inner pair of socks worn were either of strong, thick, closely woven silk or cotton. Over these I wore thick woollen socks. In order not only to prevent the socks from slipping down into the heel of the boot and causing blisters, but also to keep out sand and gravel I wore half a putty wound round the top of the boot which also to some extent prevented leeches from getting at the foot at all through the eyelets or lace holes of the boot. When leeches did happen to worm their way through the lace holes of my boots and get through the thick woollen socks they were quite unable to get through the cotton or silk socks, with the result that as they could not draw blood from anywhere on the foot they were obliged to wriggle out again on to the bare calf or thigh where the tobacco sachet could easily deal with them. Leech bites on the calf or thigh are not nearly so irritable as bites on the instep, ankle, or foot. If a leech bite is scratched by anyone whose blood happens to be out of order, it is apt to turn into a nasty sore which is difficult to heal.

Shorts are the only togs worth shooting in. One cannot climb really steep hills wearing riding breeches and putties or in fact any other kit, if there is to be any hill climbing, owing to the stoppage of the circulation of the blood in the legs. It simply cannot be done.

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Dorsal view of the pygidial margin and fringe of the Red Scale (*Chrysomphalus aurantii*, Mask.).
(For explanation of plate see end of article.)

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AN ACCOUNT OF THE OCCURRENCE OF *CHRYSOMPHALUS AURANTII*, MASK AND *LACCIFER LACCA*, KERR ON GRAPE FRUIT IN RANCHI DISTRICT, CHOTA NAGPUR, WITH A NOTE ON THE *CHALCIDOID* PARASITES OF *ASPIDIOTUS ORIENTALIS*, NEWST.

BY

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(*With a plate*).

Chrysomphalus aurantii, the Californian Red Scale, although a serious pest of *Citrus* in many parts of the world, particularly in California and Egypt, does not occur as a pest of any great importance in India. It has been recorded in this country on the following, but in no case as a serious pest. *Agave americana*, *Citrus decumana* (pomelo), and *C. aurantium* (orange), *Cycas circinalis* and *C. recurvata*, *Jasminum*, *Morinda tinctoria*, *Morus sp.* (mulberry), *Psidium guayava* (guava) and on Rose.

In this district *C. decumana* fruits are commonly found lightly attacked by the scale, and garden rose is occasionally severely attacked. A number of *C. decumana* trees introduced at Namkum in 1927-28 were found to be slightly affected by this *Coccid* in February 1933.

Mr. H. T. Bates, then Manager of the Sabaya Division of the Assam Frontier Tea Company, introduced in June 1930 a small number of one year old grafts of the Grape Fruit *Citrus decumana* var. *grandis* at Sabaya. These plants established themselves satisfactorily, but in March 1931 were found to be attacked by *C. aurantii*, the attack was not very heavy but was of sufficient intensity to warrant control measures, a reinfection was observed in January 1933 and control measures were repeated.

At this time, one of the plants was observed to be lightly infected with lac (*Laccifer lacca*, Kerr), the infection having originated apparently from a *Zizyphus Jujuba* (Ber) tree close by, which had been purposely infected for the Baisakhi crop. This is an example of lac as a pest, and the infected plant was treated in the same way as those affected by *C. aurantii*.

Of the sprays utilised Lime Sulphur was found to be effective against both *Coccids* but is not to be recommended as it scorches the foliage severely. A resin spray made up as follows was found to be fairly satisfactory. It is similar to that used by Barritt (1929) against *Chrysomphalus aonidum* in Egypt.

Resin	1 lb.
Crude Castor Oil	3 lbs.
Ammonia	1¼ lbs. (sp. gr. 0.888)
Water	180 lbs. (18 gals.)

The resin and castor oil were heated together till the former dissolved, the solution was allowed to cool and was stirred into the water to which the ammonia had previously been added. The resultant solution is a white coloured sticky emulsion, which is ready for use. It may be kept in sealed drums.

The most effective spray tested was a Kerosene soap emulsion made up as follows:—

STOCK.

Kerosene Oil	2 gals.
Karunj Soap	½ lb.
Water (soft)	1 gal.

The soap was dissolved in water heated to boiling, the kerosene was added to the mixture while still boiling hot and stirred until a thick creamy fluid

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resulted. The success of the spray depends to a considerable extent on the efficiency of the stirring. The solution may be kept in sealed drums. This stock if properly made should adhere to glass without separating into oily particles, and when spread with the ball of the finger should form a fine continuous film. It will keep for a considerable time. If insufficiently stirred the oil will separate and collect at the top.

For use the stock was diluted with water, 1 part stock to 3 parts water, and at this concentration did not scorch the foliage. Tests should however be made with various dilutions as the susceptibility of foliage to scorch varies very considerably. Spraying preferably should be done in the evening or on cloudy days, not in the full heat of the sun as this tends to cause scorch.

The female scale can be identified by the following characters:—

Scale approximately circular, average diameter about 1.5 mm., median area slightly convex, marginal area broad and flat. The scale is semi-transparent, and shows the outline of the insect below, the colour is grey, but actually appears orange yellow except marginally due to the colour of the insect lying below. The exuviae are central or nearly so, bright orange red or orange yellow in colour and are somewhat obscured by secretion. The first exuvia bears a small central boss which may bear a small nipple of white wax, the cicatrix. The exuviae are highly polished beneath. The whole dorsal surface except marginally in the living insect appears therefore orange red or orange yellow in colour.

The ventral scale is well developed, thin at the centre, stout towards the margins firmly attached to the dorsal scale, and to the body of the female as is also the dorsal scale, making the extraction of the insect difficult except by dissolving away the scales in Potassium hydroxide.

The morphology of the female has already been fully described by a number of writers including Green (1896), Newstead (1900), Herrick (1911) and Quayle (1911). The most conspicuous features are that in the living insect the rostrum is usually pushed a little to one side, and that at the period of gestation the pygidium is partly contracted within the body and is overlapped and sometimes almost enclosed by the sides of the thorax.

The pygidium of the specimens examined showed certain small differences from the normal, which are probably local variations. (see Plate)

The second lobe is frequently rounded internally and notched externally, but may be notched on both surfaces, the third lobe is almost invariably notched externally and rounded internally.

The pectinae are arranged 2-2-2-3, those in the median and second incisurae distapectinae, those in the third incisura and on the lateris unapectinae. The first pectina in the third incisura and the three pectinae on the lateris have two equal branches, between which in the case of those on the lateris a finger-like projection occurs. The unapectinae are fringed on their external margin only and in the case of the bilobed pectinae the fringing on the internal lobe is greatly reduced.

There is a pair of paraphyses to each lobe, the external paraphyse of the second lobe is much reduced and may be absent. In all specimens from this locality a distinct club-shaped thickening of the cuticle of the dorsal surface arises from the base of the third incisura (see Plate, par A), whose structure exactly that of a paraphyse, but whose disposition is abnormal. It forms the internal border of the paraphysial furrow occurring in the third incisura which would normally be formed by the external paraphyse of the second lobe.

A seta occurs external to the latadent on the ventral surface in all local specimens corresponding with the setae occurring external to each of the second and third lobes on the ventral surface.

The four calles of typical specimens occur as transverse bands of thickenings in the cephalic region of the dorsal aspect of the pygidium; in local specimens, the lateral calle is the longer and more prominent, the median is shorter and is in many specimens broken into two separate unequal parts which are adjacent, and which are occasionally connected by a narrow neck.

In view of the absence of genacerores and densariae and the presence of paraphyses, it seems probable that this species is referable to Leonardi's Genus *Aonidiella*, a course which has been followed by certain Authors.

A single adult of the *Aphelinid*, *Aphytis chrysomphali*, Mercet was taken resting on a twig infected with *C. aurantii*. This species has been reared in small numbers at Namkum from *Aspidiotus orientalis* on *Zizyphus Jujuba* (Ber).

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I should like to thank Sir Guy A. K. Marshall, F.R.S. and Dr. Ferrière for the identification of this and the following species.

A. chrysomphali is reported by Quayle (1932) as one of the commonest parasites of the Red Scale in California, he also records it from the Yellow Scale *Aonidiella* (*Chrysomphalus*) *citrina* Coq.

Comperiella bifasciata, How. (*Encyrtidae*) is a common parasite of *A. orientalis* in this district. Quayle (1932) records this species from the Yellow but not from the Red Scale in California.

Other *Chalcidoidea* bred from *A. orientalis* at Namkum were, *Physcus sp.* (near *flaviventris* How.) which was rather rare; *Tetrastichus purpureus* Cam (*Eulophidae*) as a primary and probably also as a secondary parasite (Glover, 1933), and *Marietta javensis* How. (*Aphelinidae*) as a hyperparasite of primary *Chalcidoid* parasites of this *Coccid* (Glover, 1933, reported as *Perrisopterus sp*).

In conclusion I wish to express my thanks to Mrs. Dorothy Norris, Director of this Institute, and to Dr. C. F. C. Beeson, Forest Entomologist, Forest Research Institute, Dehra Dun, for advice and criticism, to Mr. H. T. Bates for permission to experiment on his trees and to Mr. E. Heber for preparing the plate.

Since this paper was submitted for publication on July 7th 1934, a paper on the Genus *Comperiella*, Howard by Dr. T. V. Ramakrishna Ayyar has appeared in *Records of the Indian Museum*, vol. xxxvi, pt. II, June 1934. In this paper Ayyar records the Genus *Comperiella* from India for the first time, and describes a new species *C. indica* sp. nov., which he originally recorded as *Comperiella sp.* parasitic on the tamarind scale *Aspidiotus tamarindi* G. at Coimbatore where it occurs on tamarind often associated with *Aspidiotus orientalis*, N. (Imp. Inst. Agric. Res., Pusa Bull. 197, 1929).

Comperiella bifasciata is therefore recorded from India for the first time, and is the second species of this Genus known to occur in this country. *C. bifasciata* and *C. indica* are very similar, particularly as regards colouration, but may be separated by the fact that in the former the fore wing of the female has two divergent brownish fasciae, and that in the latter the fore wing of the female has one brownish fascia only.

Aphytis chrysomphali is believed to be recorded from India for the first time.

Explanation of Plate.

Dorsal view of the pygidial margin and fringe of *Chrysomphalus aurantii*.

an., anus; dp., distapectinae; ld., latadent; lm., median lobe; l. 2nd, 2nd lobe; l. 3rd, 3rd lobe; or., oraceratubae; par., paraphyses; par. A., extra abnormally disposed paraphyse; s., setae; up., unapectinae.

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NOTES ON THE SYSTEMATIC POSITION OF *SANSEVIERIA* GROWING IN INDIA WITH SPECIAL REFERENCE TO *S. LAURENTII* WILDEMAN.

BY

KALIPADA BISWAS.

About sixty-eight species of Sansevieria are known up to the present time. Of these only four are supposed to be indigenous to the Indian Empire. These are *S. lanuginosa* Willd., *S. zeylanica* Willd., *S. Roxburghiana* Schult., and *S. burmanica* N. E. Brown. *S. lanuginosa* grows wild in sandy places in Malabar coast. *S. zeylanica* is common in the drier rocky and sandy region. *S. Roxburghiana* is the most common species, and is fairly widely distributed along the coast of Coromandel, Lower Bengal, Orissa and Chota Nagpur. *S. burmanica* is wild in Upper Burma. But the systematic position of *S. lanuginosa* as a distinct species has been rightly doubted by N. E. Brown in his valuable monograph on Sansevieria published in *Kew Bull.* No. 5, p. 226, 1915, where he remarks 'It appears to be similar to *S. zeylanica* Willd'. Thus *S. Roxburghiana* is the only known species indigenous to India proper.

Most of the species of Sansevieria are confined to Africa or to the islands near its coasts and a few to Arabia. Nearly all the species found cultivated in different parts of the world are introduced. In the Royal Botanic Garden, Calcutta, there are about seven or eight species under cultivation. Of these again *S. trifasciata* of Prain is supposed to have been grown in this garden as early as 1899. It is also reported from Jalpaiguri and from Lower Sikkim area but recorded as cultivated. Prain mentions in his *Bengal Plants*, vol. ii, p. 1054, 1903, this species as 'often cultivated; sometimes as an escape' closely related to West African Bow String Hemp (*S. guineensis*) but with narrower, more definitely maculated leaves. Brown is of opinion that *S. guineensis* is not correctly named. Prain noted this species (*S. trifasciata*) as a horticultural species both in his *Bengal Plants* and subsequently in the *Rec. Bot. Sur. of India*, vol. iii, No. 2, p. 287, 1905. But Prain's *S. trifasciata* resembles very closely Dr. J. Murce's specimen of *S. nilotica*, a native of Tropical Africa, which was described by Baker in the *Journ. of Linn. Soc.*, vol. xiv, p. 548. 1875.

During comparatively late years an interesting specimen of Sansevieria with yellow striped leaves is under cultivation in and about the Royal Botanic Garden, Calcutta, and Victoria Gardens, Bombay, and elsewhere in this country (See Plate I). This species so far as its specific characters are concerned may be taken as a variety either of *S. nilotica* or of *S. trifasciata*. Considering its distinct yellow stripes of the leaves Brown takes it as *S. trifasciata* Prain, var. *Larentii* N. E. Brown. The problem which the writer attempts to solve is whether the yellow striped specimen be taken as a variety of *S. nilotica* or *S. trifasciata* and whether the

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latter should be considered a separate species. Comparison between the descriptions of *S. nilotica* of Baker and *S. trifasciata* (Hort.) Prain, shows that there is not much difference between the two species. Thus there is not sufficient ground for considering *S. nilotica* and *S. trifasciata* as two distinct species. Therefore, the question is whether *S. nilotica* or *S. trifasciata* is to be retained. According to the rules of nomenclature *S. nilotica* has been described earlier. Hence it is advisable to reduce *S. trifasciata* to *S. nilotica*. *S. trifasciata* is not an Indian species, but it is a West African species cultivated in Lower Bengal. Prain himself observes under *S. trifasciata* as follows: 'Cultivated but also sometimes in village shrubberies probably native of West Africa, but appears to have reached India from America where it is sometimes grown as *S. guineensis*, the West African Bowstring Hemp which is not naturalized and is hardly known even in cultivation in India.' Meunissier remarks that this plant has all the characters of *S. guineensis* except the yellow stripes of the leaves. Evidence recorded in the literature and examination of type sheets of Prain's *S. trifasciata* lead to the conclusion that *S. nilotica* of Baker is very likely the same species as *S. trifasciata*. Prain himself, as his above notes indicate, considers *S. trifasciata*, as grown in the Royal Botanic Garden, Calcutta, and other places, a horticultural form or variety—as may be called—of a tropical species, very likely *S. nilotica*. Prain's remark on the herbarium sheet of *S. trifasciata* confirms the above conclusion. The chief distinguishing characters, according to Brown, of *S. nilotica* Baker and *S. trifasciata* Prain, are as follows:

S. nilotica.	*S. trifasciata.*
Leaves 2-3 to a growth ; strap shaped with sides for a foot or more of the central part, deeply concave-canelled, petiole 1-2 feet long.	Leaves often 1-2, in vigorous plants 2-6 to a growth ; linear lanceolate or narrowly elongated lanceolate.
Bracts $\frac{1}{12}$-$\frac{5}{12}$ in. long. ...	Bracts $\frac{1}{8}$-$\frac{1}{2}$ in. long.
Flowers 4-10 in. cluster. ...	Flowers 3-8 in. cluster.
Flowering lobes $5\frac{1}{2}$-6 in. ...	Flowering lobes 7-9 in.

These distinguishing characters of the two species are overlapping and not quite definitely demarcated. The authentic herbarium specimen taken as *S. trifasciata* differs from yellow striped garden specimen as much as the herbarium specimens of *S. nilotica* differs. The yellow band is a very distinct character in the garden plant. The general characters noted in Brown's key to the genus in the *Kew Bulletin*, No. 5, p. 194, 1915, are applicable

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both to *S. nilotica* and *S. trifasciata*. The character: Leaves 'sometimes striped with yellow' is evidently mentioned to include the var. *Laurentii* of *S. trifasciata*, formerly confused with *S. guineensis*, as remarked by Prain in the *Bengal Plants*, vol. ii, p. 1054, 1903, and *Records Bot. Surv. of India*, vol. iii, No. 2, p. 287, 1905. Prain's *S. trifasciata* is quite a distinct plant from *Dracaena ovata* and *S. guineensis* as figured in *Bot. Mag.*, pp. 1180-81, 1809, and referred to in *Conspectus Florae Alfricae*, Durand and Schinz, vol. v, p. 140, 1895. The original descriptions of *S. nilotica* of Baker as published in the *Journ. of the Linn. Soc.*, vol. xiv, p. 548, 1875, is applicable to *S. trifasciata* of Prain as well. As far as my investigation leads me, I consider that there is not sufficient difference between *S. nilotica* and *S. trifasciata* as regards their specific characters are concerned. *S. trifasciata* of Prain may perhaps be conveniently reduced to *S. nilotica* Baker. I would, therefore, prefer to consider *S. trifasciata* a synonym of *S. nilotica*. Slight difference in the nature of the leaves and dimensions of the floral structures might be due to climatic conditions and horticultural manipulations. The illustration of the horticultural species—*S. Laurentii* given in *Gardeners' Chronicle*, vol. xlv, p. 347, 1909, is considered as a variety of *S. trifasciata* by N. E. Brown. This *S. Laurentii* is the one which tallies best with the yellow striped specimen. The living specimen was also received as *S. Laurentii* by Dr. D. S. Laud, Superintendent, Victoria Gardens, Bombay, as his following note indicates:

Sansevieria Laurentii Hort. (*S. Laurentii* Wildeman).

'Hab.—Tropical Africa, was introduced in these Gardens from Messrs. L. R. Russell, Richmond Nurseries, England, on 29th March 1923. It is cultivated in these gardens as an ornamental plant both in the open and in the conservatories for the beauty of its leaves. It has a band of creamy yellow $\frac{1}{4}$-$\frac{1}{2}$ in. or more wide along the leaf margins in addition to the regular variegation. This plant flowers and seeds in this garden. The flowers are whitish green. No attempt is made to propagate from leaf-cutting. The plant is easily propagated by divisions.'

'Mention has also been made of this variety of Sansevieria by Mr. Macmillan in his book—*Tropical Gardening and Planting*, p. 154.'

Propagation from fragments of yellow striped leaves at the Royal Botanic Garden, Calcutta, resulted in the development of a plant without yellow stripes in the leaves, although plants raised from rhizome produced plants with yellow striped leaves without fail. Reversion to plants without yellow stripes in the leaves when raised from leaf cuttings was recorded by Gerome, the head gardener at Paris, in 1914. Gerome received the yellow striped specimen directly from Prof. E. Laurent who brought this interesting plant from Belgian Congo. Experiment at Kew, as Brown mentions, had similar results. A Meunissier in *Gardeners' Chronicle*, vol. lvi, p. 144, 1914, surmises that such bad mutation —I mean reversion to parent plant when raised from leaf cuttings

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—is due to variation in cell structure in the rhizome and yellow striped leaves.

Considering the facts mentioned above, this yellow striped specimen may better be taken as *S. nilotica* Baker, var. *Laurentii* Wildeman. A detailed description of this variety as observed in the fresh specimen in comparison with the herbarium sheets of *S. nilotica* and *S. trifasciata* of Prain is given below:

Sansevieria nilotica Baker, var. *Laurentii* Wildem.

Synonym—*S. trifasciata* (Hort.) Prain, var. *Laurentii* N. E. Brown; *S. Laurentii* Wildem.

Plant with underground creeping stem, 1.3 to 2.5 cm. thick; leaves 2-3-6 to a growth, 1-3 rarely 4 ft. long and 3 to 10 cm. broad, erect, adult ones broadly lanceolate or strap shaped, sometimes the leaf blade showing a tendency to becoming somewhat spirally twisted from right to left towards the apices, but normally with the sides for a foot or more parallel, tapering towards the apices ending into a pale green, leathery, acute, more or less stout, thorny point, and gradually narrowing down to the base into a somewhat concave channelled petiole, conspicuously marked with very closely packed irregular zigzag dark green or paler green transverse bars with creamy yellow, .6 to 1.3 cm. wide stripes and somewhat cartilaginous edges, more or less overspread with glaucous bloom. Scape 1½ to 2½ ft. high, of which 1 to 1½ ft. covered with irregularly scattered flower-clusters bearing generally 3 to 6 flowers, .6 to 3.8 cm. apart. The lower part of the scape passing into 3-5 ovate, lanceolate, acute, pale brown, membraneous sheath, about 7.5 cm. long and 2.5 cm. broad. Bracts .3 to 1.3 cm. long spreading, narrowly ovate lanceolate, acute or slightly acuminate. Flowers 3-8 in a cluster, very pale greenish white or creamy white; 5 to 10 mm. long, joint at or just above the middle with persistent pedicel, 2 to 5 mm. long. Perianth lobes 1½ to 3 cm. long, linear, subacute or sub-obtuse; style 2½ to 3½ cm. long. Fruit a berry, green when immature, yellow when ripe, about 5-8 mm. in diameter. Flowering freely and profusely during cold weather, fruiting a little later.

Habitat.—Tropical Africa.

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SOME BIRDS OF CHITTAGONG.

BY

MAJOR R. S. P. BATES, M.B.O.U.

I was in Chittagong from March 5th for exactly three months. Owing to 'terrorist' activities one's movements were somewhat restricted, so the following list is by no means complete. I never got down to the sea-shore which is difficult to reach owing to lack of roads, and in fact with but one or two exceptions all the birds in the list were seen within three miles of my bungalow.

The residential station of Chittagong is built on a series of small pimples up to a couple of hundred feet in height, the end of a low narrow range running northwards parallel to the coast with a wide cultivated plain between it and the Chittagong Hill Tracts which do not concern us here at all. As one gets away from the station, these hills become more and more thickly wooded and the height gradually increases. The maze of narrow long winding nullahs between the wooded hills contains very varied types of country from grass and scanty cultivation to thick bush, and reeds, and canes, into which it is almost impossible to penetrate. Clearings and old tea gardens are also to be met with. This part of the district naturally contains a very varied and interesting avifauna. The flat cultivated areas away from these hills contain little out of the ordinary.

(8) **Corvus levaillanti andamanensis.** Andaman Jungle-Crow. The stout bill is a very noticeable feature of this crow.

(11) **Corvus splendens splendens.** The House Crow of Chittagong is a very dark bird but is apparently 'splendens'.

Dendrocitta rufa. Tree-Pie. Common. A pair in our garden had a young one (I never saw more than one) out of the nest on May 22nd.

(120) **Dryonastes ruficollis.** Rufous-necked Laughing-Thrush. Saw two pairs in the thickets and long grass at the edge of one of the long winding nullahs. One shot on May 26th proved to be a female whose organs were undeveloped. Besides other notes they have a very pleasant three-noted whistle.

Timalea pileata. Red-capped Babbler. A common bird in the hilly tracts. The testes of a male shot on April 12th were slightly enlarged. This bird has some harsh notes which I could not distinguish from the 'korkuch' of the Indian Great Reed-Warbler which is such a feature of every reed patch in Kashmir. Until I had actually run one of the birds to earth producing these notes in a reedy patch near some cultivation, I was convinced that a Reed-Warbler must reside in Chittagong. They have also quite a flute-like little descending trill of about half a dozen notes, a most pleasing effort.

Pellorneum ruficeps. A Spotted Babbler was by no means uncommon on the bush-covered hillsides, chiefly where the higher trees were few and the scrub fairly thick. A pair were often heard in an old tea garden just close to our bungalow. The only one I managed to shoot was unfortunately blown almost to pieces. This was on April 14th. It was a breeding male. The outer webs of the feathers of the sides of the neck and hind neck were more a very dark brown than blackish and the spots on the breast also dark

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brown, but on the whole it appeared to me to agree with the description of *mandellii*.

(283) **Mixornis gularis rubricapilla.** Assam Yellow-breasted Babbler. Shot a male out of a party in very thick scrub jungle in the hills on May 13th. The testes were greatly enlarged.

(362) **Aegithina tiphia tiphia.** Common Iora.

(403) **Molpastes cafer.** Red-vented Bulbul. Common. A very dark bird generally, so presumably *bengalensis* but I collected no specimens. Nor did I look for nests but came on one with three eggs in the crown of a small palm on a roadside on April 12th. Two days later it had been destroyed.

Otocompsa jocosa. Red-Whiskered Bulbul. Common from the outskirts of the station, being slightly more of a jungle bird than the Red-vented Bulbul. Took a nest of three eggs at the Foy Scheme (waterworks) on April 14th and noted numbers of young about shortly after that date. The nest in question was built into a mass of fallen leaves caught up in a bush about three feet from the ground.

(442) **Brachypodius cinereoventris.** Grey-bellied Bulbul. Two bulbuls of this genus were disturbed in a very damp heavily wooded nullah some three miles outside the station on May 20th. One of them obligingly perched quite close to me for a few moments. It was a grey-bellied bird.

(495) **Saxicola torquata.** Bush-Chat. Not very common when we first arrived. They soon disappeared.

(532) **Phoenicurus ochruros rufiventris.** Eastern Indian Redstart. One or two seen in March on passage, the last being recorded on the 17th.

(558) **Copsychus saularis saularis.** Magpie Robin. Common and breeding freely in March, April and May. Young birds seen in the nest on May 2nd in a Woodpecker's old nesting hole and again on May 18th.

Monticola solitaria. Blue Rock-Thrush. One frequented our compound until April 8th. A number were seen on passage about this time.

(639) **Siphia parva albicilla.** Eastern Red-breasted Flycatcher. Common, leaving about the third week of April.

(693) **Hypothymis azurea styani.** Northern Indian Black-naped Flycatcher. Shot a male in thick low mixed jungle on May 13th; organs considerably enlarged. They were not common.

(719) **Lanius cristatus cristatus.** Brown Shrike. Common and still much in evidence when we left in early June.

(729) **Tephrodornis pondiceriana pondiceriana.** Indian Common Wood-Shrike.

(763) **Artamus fuscus.** Ashy Swallow-Shrike. One only seen cruising round our bungalow on May 20th.

(767) **Dicrurus macrocercus albirictus.** Himalayan Black Drongo. Common. Noticed building operations in progress in a fork of a tall nim tree at the Turtle Tank on April 10th. On April 29th saw two young out of the nest being fed by their parents.

(814) **Orthotomus sutorius patia.** Burmese Tailor-Bird.

(940) **Prinia inornata.** Wren-Warbler. Not particularly common but to be met with on most of the sun-grass covered hillsides. A male and female shot on April 12th had the organs only slightly developed.

(958) **Oriolus xanthornus xanthornus.** Indian Black-headed Oriole. Common.

(964) **Gracula religiosa intermedia.** Indian Grackle. I often saw a pair of these birds in a neglected tea garden in the low hills about three miles north of Chittagong.

(969) **Lamprocorax panayensis affinis.** Tipperah Glossy Stare. Shot an immature bird on May 27th out of a flock of four containing one adult. They were feeding in some tall trees in my compound. The iris was a yellowish red.

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(982) **Sturnia malabarica malabarica.** Grey-headed Myna. Common.

(996) **Acridotheres tristis tristis.** Common Myna. Common.

(999) **Aethiopsar fuscus fuscus.** Indian Jungle Myna.

(1004) **Sturnopastor contra contra.** Indian Pied Myna. First noticed building operations on April 11th from which date they were nesting freely.

(1010) **Ploceus atrigula atrigula.** Eastern Baya. This Weaver does not wait for the commencement of the rains in the Chittagong District before commencing to breed. I noted one colony on April 21st which must have been building for some days, and during the next couple of weeks noted numbers commencing operations. Fairly tall palms were most in demand, but I saw two colonies on low leafy trees.

(1020) **Munia atricapilla rubronigra.** Northern Chestnut-bellied Munia. Common both in the cultivated areas and in the jungle. Often seen in quite large flocks, sometimes high up in tall trees, sometimes in the long grass and swampy places. The only nest I noticed was being built in a thorny bush close to a path running through quite thick jungle; date May 13th, but a few days previously I saw one picking up grass in my own compound.

(1097) **Passer domesticus nigricollis.** Burmese House-Sparrow.

(1148) **Riparia paludicola brevicaudata.** Indian Sand Martin.

(1186) **Anthus hodgsoni hodgsoni.** Indian Tree Pipit. There was a sudden influx of these birds on March 12th on passage which lasted to the end of the month.

(1195) **Anthus richardi rufulus.** Indian Pipit.

(1215) **Alauda gulgula gulgula.** Small Indian Skylark.

(1245) **Eremopteryx grisea grisea.** Ashy-crowned Finch Lark. By no means common.

(1250) **Zosterops palpebrosa cacharensis.** Cachar White-Eye.

(1279) **Leptocoma asiatica intermedia.** Burmese Purple Sunbird. Sunbirds were really quite uncommon. The only nest found was on May 26th. The female was sitting on two fresh eggs. The nest was overhanging a small much jungle-covered stream running out of one of the numerous small nullahs through some rice cultivation. It resembled most remarkably the flotsam caught up in flood time on all the canes and brambles around.

(1297) **Dicaeum cruentatum cruentatum.** Indian Scarlet-backed Flower-Pecker. A very common and familiar bird, both in the gardens and out in the jungle.

(1353) **Chrysophlegma flavinucha flavinucha.** Large Yellow-naped Woodpecker. Saw a pair in fairly thick jungle in the low hills two miles out on May 13th. In the setting sun their crests appeared lemon yellow and stood out fanwise from the head.

(1368) **Dryobates macei.** Fulvous-breasted Pied Woodpecker. Seen two or three times in the jungles bordering the Foy Scheme dam.

(1394) **Brachypternus benghalensis.** Golden-backed Woodpecker. Common A pair of these birds were boring a hole in a tree close to a Railway official's bungalow in Chittagong on April 23rd. On its completion however a pair of Common Mynas took possession.

(1432) **Thereiceryx lineatus hodgsoni.** Assam Lineated Barbet. Not very common in the station.

(1436) **Cyanops asiatica asiatica.** Blue-throated Barbet. Only seen in the jungle-covered low hills such as at the Foy Scheme.

(1446) **Xantholæma haemacephala indica.** Burmese Crimson-breasted Barbet. Somewhat scarce.

Cuculus canorus. A Cuckoo of this species was heard calling in a railway bungalow compound on April 23rd.

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(1456) **Cuculus micropterus micropterus.** Indian Cuckoo. Excessively common. They started calling in the second week of March.

Eudynamis scolopaceus. Koel.

(1479) **Rhopodytes tristis tristis.** Large Himalayan Green-billed Malkoha. I remarked this bird in the better wooded patches concealing the villages in the cultivated areas as well as in thicker jungle along the hills.

(1489) **Taccocua leschenaulti affinis.** Bengal Sirkeer Cuckoo.

(1491) **Centropus sinensis intermedius.** Hume's Crow-Pheasant. The chuckling laugh is much more frequently indulged in than the hooting note.

(1508) **Psittacula alexandri fasciata.** Indian Red-breasted Paroquet. This very noisy bird is the common Paroquet of Chittagong. Two pairs were noted nesting in holes in casuarinas in the station in April.

(1513) **Coryllis vernalis vernalis.** Indian Loriquet. Common.

(1519) **Coracias benghalensis affinis.** Burmese Roller. Quite common on our arrival in March, but all had disappeared before the month was out.

Merops orientalis. Green Bee-Eater.

(1526) **Merops superciliosus javanicus.** Blue-tailed Bee-Eater. Very common and breeding freely in April and May. An enormous colony, which must have numbered a hundred pairs, was nesting in the face of a sandy cliff close to Sholashahr Railway Station, a suburb of Chittagong.

(1533) **Alcedo atthis bengalensis.** Common Indian Kingfisher. Not very common. This was the only Kingfisher I ever saw along the streams, which were not suitable for the Pied Kingfisher. The main river and its tributaries are tidal for many miles inland, and on the only two occasions I went up by launch I saw no Kingfishers of any kind.

(1551) **Halcyon smyrnensis fusca.** Indian White-breasted Kingfisher. Common in the station and breeding freely in April and May.

Upupa epops. There is no resident Hoopoe in Chittagong. I saw three or four (probably saturata) soon after our arrival i.e. between March 5th and 17th but none after the latter date.

(1599) **Micropus affinis subfuscatus.** Malay House-Swift.

(1600) **Cypsiurus batasiensis batasiensis.** Bengal Palm-Swift.

(1661) **Bubo coromandus coromandus.** Dusky Horned Owl. Common. Their rumbling calls were to be heard in the evenings from every suitable clump of trees. We had a pair in our own compound. In Rajputana these birds called mainly in the rains and breeding season but they were calling all the time we were in Chittagong.

(1684) **Athene brama indica.** Northern Spotted Owlet. Rather uncommon. In fact I only heard them at a small village a mile or so north of Chittagong.

(1689) **Glaucidium cuculoides rufescens.** Burmese Barred Owlet. The common Owl of Chittagong. We had two pairs in our compound on the outskirts.

(1706) **Sarcogyps calvus.** Black Vulture. Quite common.

(1711) **Gyps indicus nudiceps.** Northern Long-billed Vulture. Common.

(1713) **Pseudogyps bengalensis.** Indian White-backed Vulture.

(1730) **Falco chiquera chiquera.** Red-headed Merlin. This bird was quite common in Mymensingh but I only saw it occasionally at Chittagong.

(1780) **Ichthyophaga ichthyaetus ichthyaetus.** Large Grey-headed Fishing-Eagle.

(1784) **Haliastur indus indus.** Brahminy Kite.

(1788) **Milvus migrans govinda.** Common Pariah Kite.

(1792) **Circus cyaneus cyaneus.** Hen-Harrier. The Harriers had mostly left when we arrived in Chittagong, but I saw one Hen-Harrier, a late straggler,

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on May 1st. The Pied Harrier, still common when we left Mymensingh, was never seen, and the next bird too only a couple of times.

(1794) **Circus aeruginosus aeruginosus.** Marsh Harrier. Last seen on May 2nd.

(1819) **Pernis ptilorhynchus ruficollis.** Indian Crested Honey-Buzzard. Comparatively common. A pair were always hanging about our compound, making their presence known by a high-pitched trisyllabic squeal uttered frequently when on the wing. On one occasion as I drove up to the bungalow, I nearly ran into one as I came over the crest of the hill. It was on the ground busy devouring termites. When the winged swarms appeared they were always much in evidence along with the Common and Brahminy Kites, Mynas and Crows, wheeling to and fro screaming continuously.

(1826) **Crocopus phoenicopterus viridifrons.** Burmese Green Pigeon. Building in March.

(1856) **Columbia livia intermedia.** Indian Blue Rock-Pigeon.

(1874) **Streptopelia chinensis tigrina.** Burmese Spotted Dove. Exceedingly common.

(1900) **Polyplectron bicalcaratum bicalcaratum.** Burmese Peacock-Pheasant.

(1903) **Gallus bankiva murghi.** Common Red Jungle-Fowl. Fairly common all along the hills from the commencement of the forests at the Foy Scheme.

(1921) **Gennaeus horsfieldii horsfieldii.** Black-breasted Kalij Pheasant.

(1997) **Turnix suscitator plumbipes.** Burmese Bustard-Quail.

(2022) **Amaurornis phoenicurus chinensis.** Chinese White-breasted Water-hen. Common.

(2031) **Metopodius indicus.** Bronze-winged Jacana. Very common. Every tank sufficiently weedy had at least one pair.

(2127) **Lobivanellus indicus atronuchalis.** Burmese Red-wattled Lapwing. Only seen once on May 2nd.

(2143) **Tringa ochrophus.** Green Sandpiper.

(2145) **Tringa hypoleucos.** Common Sandpiper.

(2150) **Glottis nebularia.** Greenshank.

(2170) **Capella gallinago gallinago.** Fantail Snipe.

(2173) **Capella stenura.** Pintail Snipe.

(2183) **Anhinga melanogaster.** Indian Darter.

(2218) **Ardea cinerea rectirostris.** Eastern Grey Heron.

(2225) **Egretta garzetta garzetta.** Little Egret.

(2226) **Bubulcus ibis coromandus.** Cattle Egret. Noted to be in breeding plumage on May 2nd.

(2229) **Ardeola grayii.** Indian Pond Heron.

(2237) **Ixobrychus sinensis sinensis.** Yellow Bittern.

(2238) **Ixobrychus cinnamomeus.** Chestnut Bittern. A male shot on May 24th had the testes the size of pea-nuts. It had a slightly digested whole frog in its stomach.

(2292) **Podiceps ruficollis capensis.** Indian Little Grebe.

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THE MEDICINAL AND POISONOUS SEDGES OF INDIA

BY

J. F. Caius, S.J., F.L.S.

The Cyperaceae are grass-like herbs broadly distributed all over the world, and especially in the cold regions of the northern hemisphere; they are gregarious in marshy plains, damp meadows, and the dry slopes of high mountains; they are less frequent in maritime estuaries. The family includes 85 genera, with about 2,600 species.

The medicinal and poisonous sedges of the world belong to 11 genera:—Carex (cold and temperate regions); Cyperus (Tropics and Subtropics); Eriophorum (Arctic or Northern temperate regions); Fimbristylis (Tropics); Gahnia (Australasia; from Singapore to the Sandwich Islands); Juncellus (warm regions); Kyllinga (Tropics and Subtropics); Pycreus (warm and temperate regions); Remirea (Tropics); Scirpus (cosmopolitan; as far as the Polar regions); Scleria (moist warm countries).

The medicinal and poisonous sedges of India belong to 7 genera:—Carex, Cyperus, Fimbristylis, Juncellus, Kyllinga, Remirea, Scirpus.

A. Spikelets of few or many glumes; lower 1-2 glumes always empty, uppermost male empty or imperfect, intermediate ones bisexual:	
I. Flowering glumes usually many, all distichous; no hypogynous bristles:	
1. Style bifid; flowers 1 or 2 in spikelet; rhachilla of spikelet deciduous	Kyllinga.
2. Style bifid; rhachilla of spikelet persistent; nut dorsally compressed	Juncellus.
3. Style trifid; rhachilla of spikelet persistent after fall of glumes	Cyperus.
II. Flowering glumes usually many in a spiral; hypogynous scales or bristles often present:	
1. Style-base persistent or completely deciduous; no hypogynous bristles; leafy plants ...	Fimbristylis.
2. Style-base not articulate passing into nut gradually; hypogynous bristles 0-6, undivided, linear, rarely oblong	Scirpus.
B. Spikelets sessile in dense digitate cylindric spikes; glumes 4, 3 empty, uppermost with a perfect flower	Remirea.
C. Spikelets of male or female flowers, or both; nuts enclosed in an utricle entire or 2-fid at the tip only	Carex.

Carex.

This genus includes over 900 species broadly dispersed in cold and temperate regions, a few being found in mountainous tropical regions.

C. arenaria Linn., *C. disticha* Huds., and *C. hirta* Linn. are used medicinally in Europe; *C. macrocephala* Willd. and *C. siderosticta* Hance are similarly used in China.

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Carex cernua Boott is found in Assam and extends to Tongking and Japan.

The plant is said to be toxic to cattle producing lack of appetite, loss of milk, and definite nervous symptoms.

Cyperus.

This genus includes 300 species, natives of tropical and subtropical regions, a few being found in temperate regions. It abounds on the shores of tropical rivers, and in the clearings of virgin forests.

The following species are used medicinally in Europe: *C. esculentus* Linn., *C. longus* Linn., *C. rotundus* Linn.—; in China, Indo-China, Malaya, and the Philippine Islands: *C. rotundus* Linn.—; in West Africa: *C. articulatus* Linn., *C. esculentus* Linn.—; in South Africa: *C. esculentus* Linn., *C. fastigiatus* Rottb., *C. longus* Linn., *C. sexangularis* Nees—; in Madagascar: *C. aequalis* Vahl, *C. alboviridis* C. B. Clarke, *C. esculentus* Linn.—; in Guiana: *C. elegans* Linn.

A. Rhachilla of spikelets not much winged; spikelets spicate or subracemose, linear, 6-20 flowered. Leaves and bracts long	1. *C. iria.*
B. Rhachilla of spikelets (usually conspicuously) winged:	
1. Tall plants. Stolons long, hardening into creeping rhizomes. Leaves short. Glumes approximate, closely imbricate:	
a. Spikelets shortly spicate, 12-50 flowered ...	2. *C. articulatus.*
b. Spikelets linear, pale straw-coloured	3. *C. scariosus.*
2. Tall or medium plants, stoloniferous or rhizome woody. Leaves and bracts long. Rhachilla of spikelets winged. Glumes closely imbricate:	
a. Stem at base nodosely thickened:	
i. Leaves flaccid, flat; umbels expanded, usually compound	5. *C. rotundus.*
ii. Leaves rigid, filiform, or very narrow; umbel simple, compact	7. *C. stoloniferus.*
b. Stem at base not nodose:	
i. Stem 6-12 in. high; leaves as long or nearly so	6. *C. esculentus.*
ii. Stem 12-36 in. high; leaves $\frac{1}{2}$-$\frac{3}{4}$ stem	4. *C. longus.*
3. Tall stout plants. Stolons absent. Leaves and bracts long. Umbel large, compound. Spikes and spikelets many. Rhachilla of spikelets conspicuously winged. Anthers apiculate, not rarely crested. Style with its three branches small. Nut small ashy black. Spikelets linear subterete suberect dirty straw-colour	8. *C. platyphyllus.*

1. **Cyperus iria** Linn. is found throughout India and Ceylon in rice fields. It extends to Malaya, Indo-China, China, Japan, Australia, Afghanistan, Persia, the Mediterranean, and tropical Africa.

The plant is tonic, stimulant, stomachic, and astringent.

Among the Mundas of Chota Nagpur the tuber is ground together with that of *C. rotundus*, and drunk in fever.

Bengal: Burachucha—; *Hasada*: Jimtu—; *Hindi*: Burachucha, Nagarmotha—; *Lao*: Yak dan din—; *Malay*: Rumput tuloh belalang—; *Mundari*: Huringloeongjimtu, Loeongjimtu, Loeongjintu—; *Naguri*: Jindu—; *Rajputana*: Moth—; *Sinhalese*: Welhiri—.

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2. **Cyperus articulatus** Linn. occurs from Bengal to Ceylon on the banks of rivers and lakes. It inhabits the tropical and warm regions of both hemispheres.

The tuber is a good tonic and stimulant. It is used medicinally in Hausaland.

Arabic: Chasegj—; *Betsimisaraka*: Mita—; *Egypt*: Goreyb—; *Guinea*: Gorhe, Madia—; *Kanuri*: Kajiji—; *La Reunion*: Jambelon—; *West Indies*: Adrue—.

3. **Cyperus scariosus** Br. is found in Bengal and Pegu, and extends thence to Australia.

The root is recognized by both Ayurveda and Yunani. Hindu writers describe it as pungent, acrid and cooling; promoting the flow of milk; regulating the bodily temperature by its antipyretic and sedative action; useful in the treatment of biliousness, fever, dysentery; relieving thirst, fatigue, burning sensations, and bad taste in the mouth.

Mohammedan authors qualify the taste of the root as bitter, hot, and unpleasant. As a drug it relieves flatulence, stimulates the menstrual discharge, enriches the blood, and improves the appetite; it also checks abnormally profuse menstruation and urination; it is useful in the treatment of stuttering, offensive discharge from the nose, eye sore, brain and chest troubles, piles, swellings, lumbago, and scorpion sting.

In practice the root is considered cordial, stomachic, and desiccant; also diaphoretic and diuretic. A decoction is used in gonorrhoea and in syphilitic affections; and it has been found useful as an astringent in diarrhoea.

In cases of epilepsy the root is given in combination with valerian.

Caius and Mhaskar have shown experimentally that the drug is not an antidote to scorpion venom.

Arabic: Soad, Soadekufi—; *Bengal*: Nagarmutha—; *Burma*: Vomonniu—; *Canarese*: Konnarigadda, Nagarmusthe—; *Deccan*: Nagarmotah—; *Gujerati*: Nagaramothya—; *Hindi*: Nagarmotha—; *Malayalam*: Korakizhanna—; *Marathi*: Lawala—; *Persian*: Mushkezamin—; *Sanskrit*: Chakranksha, Charukesara, Chudalapindamusta, Kachharuha, Kalapini, Nadeyi, Nagarmusta, Nagarotha, Shishire, Vrishadhmankshi, Uchchta—; *Tamil*: Koraikilangu—; *Telugu*: Kolatungamuste, Tungagaddalaveru—; *Urdu*: Nagarmotha—.

4. **Cyperus longus** Linn. occurs at Quetta and Mount Abu. It extends westwards to the Atlantic.

The bitter aromatic tuber is used in Spain as a stimulant, stomachic, and emmenagogue.

The Zulus prepare an enema from the tuber for children with stomach troubles. They also blow the powdered tuber into the nose and ears for colds and other troubles in these regions, and the tuber may be chewed for the same purposes.

At Filabusi in Southern Rhodesia the juice of the plant is regarded as being very poisonous and is said to burn the skin when applied to it.

Catalan: Castanyola—; *Chinese*: Hiang Fou Tzeu—; *Egypt*: Sa'ad—; *Filabusi*: Mlabie—; *French*: Souchet long, Souchet odorant—; *Italian*: Giunco odorato—; *Spanish*: Juncia olorosa—.

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5. **Cyperus rotundus** Linn. is common in waste grounds, gardens, and roadsides in open spots. It is found throughout India and Ceylon, and in all warm parts of the world.

Ayurvedists describe the root as pungent, acrid, cooling, astringent, bitter, stomachic, and anthelmintic. It restores lost appetite, and is useful in leprosy, thirst, fever, diseases of the blood, biliousness, dysentery, intense itching, pain, vomiting, epilepsy, ophthalmia, and erysipelas.

According to Arabian and Persian writers the root is attenuant, diuretic, emmenagogue, diaphoretic, anthelmintic, and vulnerary. They recommend it for the treatment of ulcers and sores, fevers, dyspepsia, and urinary calculus. They prescribe it in large doses as an anthelmintic.

The roots are commonly used as a diaphoretic and astringent. They are also credited with stimulant and diuretic properties. They are held in great esteem as a cure for disorders of the stomach and irritation of the bowels. They are scraped and pounded with green ginger and, in this form, mixed with honey, they are given in cases of dysentery in doses of about a scruple, and are said to have been given with benefit in cholera. They are used too as a worm remedy. In the Philippines the bruised root is applied to the face for toothache.

In the Konkan the fresh tubers are applied to the breast to stimulate the flow of milk. In Chota Nagpur a decoction is used in fever.

In Malaya the tubers are smoked in cases of pain in the nose. In Cambodia they are a common remedy for fever and retention of urine.

According to the Chinese the small tubers act on the lungs and liver. Their general action is tonic, stimulating and stomachic.

In Ceylon a decoction is given in fever, diarrhoea, dyspepsia and stomach complaints.

The tuber is an Ayurvedic medicine for snake bites and scorpion stings; but Mhaskar and Caius have demonstrated that it is useless in the treatment of either snake bite or scorpion sting.

Sanjiva Rao, Panicker and Sudborough have studied the chemical composition of the essential oil from the tubers, but have not been able to isolate any pure substances from it (1925). Further work (1928) by Kimura and Ohtani does not throw any light on the therapeutic properties of the drug.

Annam: Cu co, Huong phu—; *Arabic*: Suad—; *Australia*: Yelka—; *Bengal*: Ghun, Motha, Mutha, Nagurmotha—; *Bicol*: Botobotones—; *Bombay*: Barikmoth, Musta—; *Cambodia*: Kravalchruk, Kravanhchruk—; *Canarese*: Tungegadde—; *Chinese*: Houi T'eou Ts'in, Hsiang Fu, So Ts'ao—; *Deccan*: Korekijhar—; *Egypt*: Burbeyt, Dis, Negil, Sa'ad, Sa'ad-el-homar, Sibl-el-ma'iz—; *English*: Nut Grass—; *Guam*: Chaguan, Humatag—; *Gujerati*: Motha—; *Hamadan*: So-ad—; *Hasada*: Sunumsangga—; *Hausa*: Ayaaya—; *Hindi*: Ghun, Motha, Mutha, Nagurmotha—; *Ho*: Rotesila—; *Iraq*: Ghusainiyah, Sa'ad, Su'aid, Sijil—; *Japan*: Hamasage, Kobushi—; *Kut*: Ghusainiyah—; *Lao*: Ya m'niu mu—; *La Reunion*: Oumine—; *Malaya*: Heong foo, Rumput haliva hitam—; *Marathi*: Bimbal, Motha—; *Mundari*: Bathabiiir—; *Naguri*: Mothatasad, Pirjimtu—; *Nasirabad*: Kabb—; *New Caledonia*: Jilio—; *Pampangan*: Cusung, Galonalpas, Malaapolid, Mota, Omading, Omadiung, Onoran, Sursur—; *Persian*: Suad, Su'd, Muschk-i-zemin—; *Sadani*: Mothaghas—; *Sanskrit*: Abda, Arnoda, Bhadrakshi, Bhadramusta, Gangeya, Granthi,

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Gundra, Hima, Kachhola, Kakshottha, Kasheru, Krodeshtha, Kuru, Kurubilva, Kutannata, Musta, Mustaka, Sugandhigranthila, Valya, Varahi, Varida, Vindakhya—; *Santali*: Tandisura—; *Sinhalese*: Kalanduru—; *Sokoto*: Girigiri—; *Spanish*: Juncia redunda—; *Sudan*: Seid—; *Tagalog*: Mutha—; *Tamil*: Kora, Korai—; *Telugu*: Bhadramuste, Gandala, Kaivartakamuste, Mustakamu, Shakhatungaveru, Tungamuste—; *United States of America*: Nut Grass—; *Uraon*: Utrubanda—.

6. **Cyperus esculentus** Linn. inhabits the Upper Gangetic Plain and is found scattered from the Punjab to the Nilgiris and Anamalais. It is distributed over Southern Europe, Africa and America.

According to Ayurveda the tuber is cooling, sweet, acrid; galactagogue, astringent to the bowels, aphrodisiac; sharpens the appetite and improves the taste; useful in eye troubles, burning sensations, and leprosy; disturbs both heat production and heat regulation in the body.

The juice expressed from the tubers is used as an aphrodisiac in Sierra Leone and on the Gold Coast. In Guinea the tubers are given as a cooling drink; the leaves are applied topically for headache.

The root is an Egyptian remedy for colic and hypochondriasis.

The Zulus chew portions of the root for the relief of indigestion, especially when this condition is accompanied by foul breath. Zulu girls, with a view to hastening the inception of menstruation, eat porridge in which a handful of the boiled roots has been mashed.

In Madagascar the tuber is used as a stimulant and aphrodisiac.

The tubers are used as a vegetable in Southern Europe, and Northern and Southern Africa, and, after roasting and grinding, as a substitute for coffee and cocoa. They contain fatty acids, sucrose and starch; but no alkaloid, caffeine or asparagin.

Ada: Fie—; *Afrikaans*: Euntjie, Hoenderuintjie, Uintjie—; *Catalan*: Chufa—; *Egypt*: El-aswad, Es-sogheyyer, Habb-el-'aziz, Habb-el-'azizza, Sa'ad—; *English*: Chufa, Earth Almond, Ground-almond, Nut Sedge, Rush Nut, Tiger-nuts, Zulu Nut—; *Ewe*: Fie, Fio—; *Fanti*: Atadwe—; *French*: Souchet comestible, Souchet sultan, Souchet tubéreux, Trasi—; *French West Africa*: N'ton—; *Fufulde*: Watuje—; *Ga*: Atangwe—; *Greek*: Kiperos—; *Hausa*: Aya—; *Hindi*: Chichada—; *Hova*: Karepoka—; *Krevi*: Fio—; *Krobo*: Fai—; *Madagascar*: Karekika—; *Malinke*: Toki—; *Malta*: Babbagiggi, Chufa, Dolcichini, Edible Rushnut, Habbghaziz—; *Punjab*: Dila, Kaseru—; *Sanskrit*: Kaseruka, Kshudramusta, Sugandhi, Sukanda, Sukareshta—; *Spanish*: Chufa, Juncia avellanada—; *Transvaal*: Einches—; *Twi*: Atadwe—; *United States*: Chufa—; *West Africa*: Rush Nut, Tiger Nut—; *Zulu*: inDawo—.

7. **Cyperus stoloniferus** Retz is found on the shores of India, especially in sea sand, from Sind to Ceylon, Coromandel and the Malay Peninsula. It has also been found in the Nilgiri Mountains. It is common in Malava where it is found in the sandy sea shores, and in tidal mud: in the former short and wiry, in the latter taller and longer-leaved. It is distributed to China, Australia and Mauritius.

The scented tuber is reputed stomachic, and considered a good stimulant for the heart.

Persian: Mutransialian—; *South India*: Jatamansi—.

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8. **Cyperus platyphyllus** Roem. and Schult. occurs in the Deccan Peninsula and in Ceylon.

The tuber is said to be tonic and stimulant.

Fimbristylis.

This genus consists of 225 species, chiefly tropical.

Fimbristylis junciformis Kunth occurs throughout India from Kashmir to Madras and Pegu, up to altitudes of 1,500-5,000 ft. It is also found in the islands of Ceylon and Madagascar and the Philippines.

The Santals use the root in dysentery.

Santali: Bindimuthi—.

Juncellus.

The genus numbers about 20 species inhabiting all warm regions.

Juncellus inundatus C. B. Clarke is frequent in swamps, from Sylhet to the sea. It extends to China.

The tubers are used as a tonic and stimulating medicine.

Bengal: Pati—; *Hindi*: Pati—.

Kyllinga.

This genus includes 50 species inhabiting tropical and sub-tropical regions.

K. odorata Vahl is used medicinally in Brazil.

A. Nut-bearing glume winged in upper half of keel ... 1. *K. monocephala.*
B. Nut-bearing glume not winged in the upper half of its keel:
1. Rhizome practically absent ... ... 2. *K. triceps.*
2. Rhizome elongate ... ... 3. *K. brevifolia.*

1. **Kyllinga monocephala** Rottb. is found throughout India and Ceylon, generally growing in the shade. It is very common in the waste grounds and along the roadsides of Singapore and other parts of the Malay Peninsula. It occurs in the hot and warm regions of the Old World, except the Mediterranean.

The root is a popular cooling medicine much used in fevers. It is often used in the same way and for the same purposes as that of *K. triceps*.

The herb is used as an antidote in many parts of India; but Mhaskar and Caius have shown that it is not an antidote to either snake venom or scorpion venom.

Bengal: Nirbishi, Svetagothubi—; *English*: Button Sedge—; *Guam*: Botoncillo, Chaguan lemae—; *Hawaii*: Kaluja—; *Hindi*: Nirbishi, Swetgothubi—; *Malay*: Rumput butong—; *Malayalam*: Mottenga, Pimottenga—; *Marathi*: Mustu—; *Pampangan*: Malaapolid—; *Sanskrit*: Musta, Nirvisha—; *Tagalog*: Anuang—; *Visayan*: Barubatones, Barubotones, Bolobotones, Borobotones, Bosicad, Botonsilo, Malabotones, Mutha, Sudsud, Tobotobolangit—.

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2. **Kyllinga triceps** Rottb. is to be found in Sind, Gujerat, Deccan, Konkan, the Southern Mahratta Country, the North-West Provinces, Rajputana, Burma, Ceylon. It extends to China, North Australia and Africa.

The herb is an Ayurvedic drug described as bitter and cooling, good against infection or poison, useful in healing wounds and regulating the heat of the body, valuable in the treatment of nervous troubles and of diseases of the blood.

In Malabar a decoction of the roots is used to relieve thirst in fevers and diabetes. Oil boiled with the roots is used to relieve intensive itching of the skin.

The roots yield an essential oil which is used to promote the action of the liver and to relieve thirst in fevers and diabetes.

Bengal: Nirbishi, Svetagothubi—; *Hindi*: Nirbisi, Shwetgothubi—; *Malayalam*: Mottenga, Pimottenga—; *Marathi*: Mustu—; *Sanskrit*: Apavisha, Avisha, Nirvisha, Vishabhava, Vishaha, Vishahantri, Vishavairini, Vivisha—.

3. **Kyllinga brevifolia** Rottb. is common throughout India, Ceylon and Malacca. It is common on roadsides and waste ground in the Malay Peninsula. It thrives in all warm regions, except the Mediterranean.

The Malays use the rhizome for poulticing sore legs.

Malay: Rumput tuki—.

Remirea.

The only species of this genus, **R. maritima** Aubl., is found on all tropical sea-shores. It is common in sea-sand in Canara, Tenasserim, the Malay Peninsula, the Nicobars, Ceylon. It is very common in tropical America.

The stock is astringent and diuretic. An infusion of the root is given as a sudorific and diuretic in Brazil and Guiana.

Betsimisaraka: Bararatandriaka—; *Brazil*: Paratura—; *French Guiana*: Remire—.

Scirpus.

The genus includes about 200 species, dispersed all over the world, as far as the Polar regions.

S. lacustris Linn. is used medicinally in Europe, *S. maritimus* Linn. in China, *S. cernuus* Vahl and *S. paludicola* Kunth in South Africa.

A. Nut marked with transverse wavy lines; hypogynous bristles absent:
  1. Spikelets in a single lateral dense head ... 1. *S. articulatus.*
  2. Spikelets clustered in rays of a lateral umbel ... 2. *S. corymbosus.*

B. Nut not marked with transverse wavy lines; hypogynous bristles present:
  1. Glumes 2-fid at the apex:
    a. Stems cylindrical. Rhizome thick ... ... 3. *S. lacustris.*
    b. Stems trigonous. Rhizome with tuber-like round swellings ... ... 4. *S. maritimus*
  2. Glumes not 2-fid at the apex ... ... 5. *S. grossus.*

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1. **Scirpus articulatus** Linn. is found throughout India from the Himalaya to Ceylon and Moulmein, ascending up to 3,000 ft. It extends to the Philippine Islands, Australia and Africa.

The plant is used as a purgative.

Bengal: Putputichechka—; *Hindi*: Chichora, Patpatichechka—; *Telugu*: Luttipittaalli—.

2. **Scirpus corymbosus** Heyne occurs in Western India, Mount Abu, Goonah, Jubbulpore, Hyderabad and Bangalore. It is also found in Africa and Madagascar.

In South Africa it is suspected to be poisonous to cattle.

3. **Scirpus lacustris** Linn. is to be found in Kashmir and Ladak reaching altitudes of 4,500-5,000 ft., also in Muneypore. It is distributed over Europe, Africa, Australia and North America.

The stock is astringent and diuretic.

French: Jonc des chaisiers, Jonc d'eau, Jonc d'étang, Scirpe des marais—; *Madagascar*: Sabotraka, Savotraka—; *Malta*: Bass, Common Bulrush, Giunco di palude—.

4. **Scirpus maritimus** Linn. is found from Kashmir, Kashgar —10,000 ft., and Moradabad to Mysore and Malabar. It is distributed all over the Old World and is represented by varieties in Australia and America.

The root is used in China as an astringent and diuretic.

Chinese: Ching San Ling—; *Egypt*: Debshe—; *Malta*: Sea-side Clubrush, Spurt Grass, Mosca, Erba nocca—; *Nasirabad*: Kab—; *Punjab*: Dila, Murak—; *Sibi*: Kab—.

5. **Scirpus grossus** Linn. fil. occurs throughout India with the exception of the North-Western area. It is found from Sind and Assam to Ceylon and Malacca, extending to the Malay Islands, Cochinchina and Indo-China.

According to Ayurveda its properties are the same as those of *Cyperus esculentus*.

Yunanists describe the root as slightly sweet, cooling, laxative, tonic to the liver, good against infection and poison, diuretic; useful in burning sensations, vomiting, diarrhoea, fever, and gonorrhoea.

The root has astringent properties and is given to check diarrhoea and vomiting.

Bengal: Kasura, Kesari, Kesor, Kesur—; *Bombay*: Kachera—; *Hindi*: Kasuru, Kesur—; *Malay*: Rumput mendarong, Rumput murong, Rumput musiang—; *Marathi*: Kasara—; *Mundari*: Jomekesari, Kesari, Khesari, Marangkesari—; *Sanskrit*: Gundakanda, Kaseru, Kaseruka—; *Telugu*: Gundatungagaddi—; *Uraon*: Kesari—; *Urdu*: Kaseru—.

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REVIEWS.

I. POPULAR HANDBOOK OF INDIAN BIRDS. By HUGH WHISTLER, F.Z.S., M.B.O.U. Second Edition. Illustrated. Gurney & Jackson, London (1935). Price 15 shillings net.

Lovers of Indian bird-life will welcome the appearance of the second—revised and enlarged—edition of this useful volume, first issued in 1928 and reviewed on page 180, vol. xxxiii of the *Journal*. As most of the outstanding features of the work have already been commented on by the previous reviewer, it is only necessary now to indicate wherein the present volume differs from its predecessor and to what extent the criticisms then made have been met.

As against the 17 full page plates (81 figures) including 4 in colour, and the 85 text-figures of the first edition the present work contains 20 full page plates (95 figures) of which 5 are coloured, and 96 figures in the text. The number of pages in the present edition is 513 as against the previous 438, while for the 250 species described at length before there are now 275 besides which 230 species are mentioned in short paragraphs giving the salient points in their description and distribution. Most of the commoner birds of the vast Indian Empire thus find a place in the present volume. The text has been carefully revised and brought in line with the advances made by Indian ornithology during the last few years.

The criticism on the first edition—partly justified—that it dealt very largely or more or less exclusively with the birds of North-West or Western India no longer holds, and though the author fully realises the impossibility of any two opinions agreeing as to which are and which are not amongst the really 'common' birds of India, he has succeeded remarkably well in making the selection as representative as possible.

Sizes of birds given in inches, as is the case in the present volume, convey extraordinarily little to the man in the street. We would have liked the sizes expressed in some more intelligible form e.g. by comparison with some of our commonest species such as Crow, Myna, Bulbul, Sparrow and others. A table of measurements of these 'standards' at the beginning of the book might have helped the reader to get a better idea of the figures where they appeared in the text. Personally we also think—and perhaps many may not agree—that the time is long past when even in popular ornithological works the use of the inch as a unit of measurement should be encouraged. In view of present-day methods and tendencies and of the universal recognition of geographical races, it seems to us necessary and desirable that ornithologists should grow up with their ideas of size in millimetres rather than in inches and their cumbersome fractions. Therefore, *if* measurements are given at all they should, to be of any value, be expressed in the metric system. It is only fair to mention, however, that in the present instance these points have not been overlooked by the author. He weighed them carefully but finally came to the conclusion that as the measurement of length is practically valueless except to the 'popular' observer, it might be as well to give it in inches since they are familiar to him, and even the most lay can hold his two forefingers up and say 'That is about six inches'.

Inspite of the increase in bulk and contents it is gratifying to note that the old price has been maintained. The book in its present form is all that the average bird-lover can desire and, as it fills a very distinct niche in Indian natural history literature, we can confidently predict the same popularity for it as was enjoyed by its predecessor.

S. A. A.

II. TIGER UND MENSCH. By BENGT BERG. 9½"×7". 187 pages, 63 plates. Dietrich Reimer/Ernst Vohsen, Berlin (1935). Price, 4.80 R.M.

On the continent of Europe the name of Bengt Berg is synonymous with superbly illustrated books on natural history. He enjoys the reputation of being one of the foremost nature photographers and has a style of writing

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that goes direct to the heart of the nature lover. Both these qualities reflect directly upon the popularity of his wide and ever-increasing range of books, many of which have run into several editions and to between twenty-five and thirty-seven thousand copies each.

The earlier publications on which rests the fame of Bengt Berg concerned themselves mostly with birds, but spurred no doubt by his achievements and by the possibilities he discovered when in India some years ago to make photographic records for his book *Der Lämmergeier im Himalaya*, he has of recent years taken to photographing the wild animals of the Indian jungles. His magnificent studies of the Rhinoceros (*R. unicornis*) in Bengal may be seen in his book *Meine Jagd nach dem Einhorn*, published in 1932 or thereabouts.

The present book, dealing principally with the tiger, is evidently written for stay-at-home foreigners who have only seen the animal behind bars in a Zoo, and have at best somewhat hazy and fantastic notions regarding its life and habits. While it contains nothing that can be called startlingly original or which cannot be found in any good book on Indian natural history, some of the points dealt with are of more than usual interest and reflect keenly on the author's powers of observation. As the book is in German and may not be intelligible to many of our readers, it may perhaps be desirable to touch on some of its contents briefly, though this must necessarily be in rather disjointed fashion.

Doubt is cast by the author on the customary explanation for striped and spotted colouration that it is protective or obliterative in a jungle environment, since most of its possessors move about chiefly in the dark when there is no sunshine through the foliage or the grass and reeds to render the colouration advantageous. It is stressed, however, that spotted or striped colouration is most obliterative in moonlight.

It is suggested that the fact of there being so many more tigresses than tigers may be accounted for by the probability that adult males kill off their male descendants as soon as the latter start coming into direct competition with them. The Maharajah of Alwar, who is said to possess an incomparable knowledge of the tiger of his part of the country, assesses the proportion of tigers to tigresses as 1:5. In Alwar it appears that only tigers are shot and tigresses spared, which may account for this great disparity, but even elsewhere the proportion of the sexes is unequal. The author believes that the tiger is polygamous and claims to have studied the relations of the sexes first hand when after them for photographing purposes. The tiger is said to visit successive females in different areas or valleys, may be 10 or 15 kilometers distant from one another. Their wooing and courtship ceremonials as read from the spoor of a pair are described, and at page 59 a photograph is given of the impression in the sand on a stream bank where copulation had taken place.

A story retailing the steps that lead up to the making of a man-eater is rather well told, and the photograph accompanying it of a tigress slinking downhill through bamboo jungle is a particularly lifelike one.

The author agrees with most sportsmen in considering that Kipling is wrong in giving a better character to the panther in the *Jungle Book* than to the tiger.

The economic usefulness of the tiger is indicated by the statement that in many places where tigers have been shot out, jungle villages have had to be abandoned owing to the enormous increase in pigs and deer which rendered agriculture impossible. Many aboriginals are said to exist solely on food obtained from tiger kills through following the movements of vultures.

The correctness of the huge annual mortality statistics, officially attributed to tiger, panther and other wild animals is questioned. The author thinks they may be due to incorrect information supplied by petty officials, as whenever any unaccountable disappearance or death takes place in a village, it is either attributed to tiger or panther, or in their absence to cobras.

The comparative risks involved in following up wounded animals is discussed. Tiger and lion are given first place on account of their powers of concealment and of making themselves invisible coupled with their extreme vitality—even when mortally wounded—and the septic nature of their bites and mauling. Owing to the wooded character of the tiger's terrain as compared with the lion's, the former is considered far more dangerous and the relatively greater casualties among tiger hunters is cited as evidence of this.

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The various methods of hunting tiger in India—machans, beats, etc., are described.

The author estimates—on what grounds we are not told—that the Hyderabad State may contain from five to six hundred tigers. Far behind come three or four States with half that number, and after these 50 to 150 tigers can be reckoned in each of the better-known tiger hunting States. He guesses that Nepal has probably not more tigers than Hyderabad. It is observed that their tiger population is an asset to the princes, not so much for their own sport as for entertaining distinguished guests with. 'Whoever in India can present a highly placed guest with a tiger, has a trump card in his hand which puts every other in the shade.' One Maharaja said to the author about his neighbour: 'A fine State and an excellent administrator, but' (this with a satisfied chuckle) 'he has no tigers!'

Some shrewd remarks concerning the shoots of distinguished guests in Indian States, the arrangements made for them and the measuring of tigers shot by the great ones show keen insight on the author's part. He has, however, great praise for the sportsmanship of the Indian princes. The Maharaja of Rewa is said to have shot over 600 tigers and hopes to complete his 1,000 some day.

There follows an extraordinary story of a vendetta between Bani Singh (a 'Bengali'!) and Yat Aung, a Burman, where the former is forcibly, and through an artifice, tied up as bait for a man-eating tiger. It is a bizarre and hair-raising episode graphically told, and remarkable, if true.

The facsimile reproduction of a letter from the Divisional Forest Officer, Nimar Division, testifying to the fact that the author's wife sat up alone in a machan one night and shot two tigers seems to us somewhat superfluous, but it perhaps carries its appeal to foreign readers!

The last chapter deals chiefly with the Rhinoceros (*R. unicornis*) and its present position in Bengal where it had recently reached the point of extinction at the hands of roving bands of poachers backed by Chinese gold. The author, by his book *Meine Jagd nach dem Einhorn*, claims to have roused the interest which culminated in the protective measures that have since been enforced. We are constrained to challenge this claim as extravagant, and not only unfair to Shebbeare, the Chief Conservator of Forests, Bengal, who has been the prime mover in this matter for years, but also an insult to the Forest Department and to the various bodies that have been striving in the interests of Wild Life Conservation in India.

Bengt Berg photographed a rhino calf three years previously and the same animal (distinguished by an old wound mark) again in the same spot on his last visit. He observes that unlike elephants, the rhino remains constant to its haunts, a factor which facilitates its destruction by poachers, but at the same time simplifies the question of its supervision by game watchers.

Particular interest attaches to this book in view of the somewhat warm discussions that have recently taken place in the Miscellaneous Notes section of the *Journal* regarding the ethics of flashlight photography. The objection raised was that the methods employed by Bengt Berg (for his identity can no longer remain concealed) in photographing wild animals at night were reprehensible and unsportsmanlike. What this gentleman apparently did in India was to plaster the jungle, especially the vicinity of water-holes, etc., with a number of automatic cameras worked by trip-wires running across the beaten tracks of animals. When the wire was tripped, the flash went off with the report of a hand-grenade and, being synchronised with the shutter, resulted in the animal photographing itself. It was contended that a number of such explosions going off in the course of a night had the effect of scaring away wild animals and speedily clearing the neighbourhood of game. If such methods of photographing were indulged in solely with the object and under the name of 'sport', we would join forces with the critics to condemn them whole heartedly. Fortunately, by virtue of the cost of such outfits and the expense of working them, it is unlikely that Bengt Berg's methods will ever become a serious menace to wild life in India. In the author's case, we think it is patent that he was not indulging in this pastime for the sake of sport alone. He was plainly doing it to obtain material for his books, one of which we have before us now, and naturally he wanted the maximum of results in the minimum of time. Illustrated books of this kind are all too few in India not to be

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welcomed whenever they appear, and considering that they help, as little else can, in arousing interest in wild life and creating public opinion in its favour—vital to the success of any efforts at conservation—we are of opinion that some slight indulgence is called for of means that justify the end so admirably, especially as they result in no *permanent* harm to wild life. It will be realised by all, of course, that a thing of this sort can very easily be overdone and therefore, as a general practice, it is one to be discouraged.

The reproduction of the photographs does full justice to their charm and exquisiteness, and the printing of blocks on both sides of a sheet, has in our opinion, not detracted in any way from the artistic quality of the work as has been claimed by the publishers of two well-known books of the kind in England. An agreeable feature of the volume is its very modest price, equivalent at the present rate of exchange to about five rupees; this is a factor that must tell a great deal on its circulation under present economic conditions.

It is rather a pity that the letterpress should have been in the ornate Gothic type and not the clearer, easily-read Roman as has lately been the tendency in Germany to adopt. But this reversion may perhaps be part of the Hitlerian campaign for purification of Nordic institutions!

The excellent photographs alone entitle the book to a place in every nature lover's library.

S. A. A.

III. ZUR KENNTNIS NORDOSTASIATISCHER VÖGEL: Ein Beitrag zur Systematik, Biologie und Verbreitung der Vögel Kamtschatkas und der Kurilen. By STEN BERGMAN. Paper cover 10″×8″; 268 pp.; 2 maps; 16 plates. Albert Bonniers Förlag, Stockholm (1935). Price, 20 Kronor.

This volume embodies the results of the author's two ornithological expeditions, the first to the Kamtschatka Peninsula (1920-22) and the second to the Kuril Islands (1929-30) north of Japan.

The expeditions were financed by the Swedish Academy of Sciences, the Swedish Anthropological and Geographical Society and by other institutions and private persons. One of the latter, being a ship-owner, provided free transport to the members of the first expedition and their baggage to and from Japan, a form of public spiritedness that may well be emulated by our own shipping magnates and railway authorities in India!

The collections made by the expeditions were worked out by the author at the Natural History Museum, Stockholm, with the collaboration of such eminent authorities as Prof. Dr. Einar Lönnberg, Prof. Dr. Hialmar Rendahl and Dr. Nils Gyldenstolpe. The Leningrad Museum was also visited in this connection and we find the help of the late Prof. P. Suschkin and of the present director of the Bird Department, Dr. B. Stegmann, acknowledged. The material from Kamtschatka was partly sold and partly presented to the Stockholm Museum, while that from the Kuril Islands, which was richer both in species and in specimens, was presented by the author to the same institution.

A comprehensive history of ornithology in Kamtschatka and the Kurils is followed by geographical and topographical notes on the Peninsula and Islands, also some data as regards vegetation and climate. Then comes a short account of the author's itinerary on the two expeditions which is succeeded immediately by the systematic lists, arranged in separate sections, and containing some good field notes. Unfortunately we find no separate section dealing with Migration which would have added very considerably to the usefulness of the work as far as we in India are concerned. Since the author was in Kamtschatka continuously for three summers and two winters, he must have had the opportunity for accumulating ample data bearing on this subject. The times of arrival and departure of migrants are, however, briefly mentioned under individual species.

To us in India the greatest interest in the book lies in the fact that many of our winter visitors, especially to Assam and Burma, but also to Ceylon and the eastern side of the peninsula, come from round about the parts dealt with therein. Of the 133 forms listed from Kamtschatka we notice that 42 are cold weather visitors to the Indian Empire, while of the 144 forms from the Kurils we receive no less than 47. Many of these birds breed in the Kamts-

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chatka Peninsula and/or the Kuril Islands, but others merely pass through on their way to and from their breeding grounds still farther north.

It is good to find that wherever a race is listed which has at some time or other been described as a novelty by the author himself, the reference and original description is quoted in extenso making it convenient for workers who cannot have access to all the journals—mostly Swedish—in which they were first published.

The fact that specimens of *Muscicapa latirostris* from the southern Kuril Islands in the proximity of northern Japan, have been determined as belonging to the typical race, *latirostris* Raffles, and not to *poonensis* Sykes which according to the *Fauna* (vol. ii, p. 249) they should be, would appear to support the contention of Messrs. Whistler and Kinnear (*J.B.N.H.S.*, vol. xxxvi, p. 86) that this Flycatcher has no races—at any rate that *poonensis* of the *Fauna* cannot be recognised. The measurements given by Mr. Bergman for his Kuril specimens (3 ♂♂ wing 70-72 mm., 4 ♀♀ wing 68.5 mm.) certainly agree well enough with birds from Sumatra etc. (*latirostris* according to the *Fauna*) as well as with those from the plains of India and also again with the measurements given by Mr. Stuart Baker for birds from 'Japan to the Himalayas' (i.e. his *poonensis*).

The photographs—32 in all—of topographical, vegetational and avian subjects are excellent, and the extensive and useful bibliography at the end of the book adds considerably to its value as a work of reference.

S. A. A.

IV. LAC AND INDIAN LAC RESEARCH INSTITUTE. By Dorothy Norris, P. M. Glover and R. W. Aldis. (Calcutta, 1934. Price Rs. 2-8.)

The Indian lac industry was greatly affected by the war, as it not only altered the value but also the direction of the lac trade. The lac, as is well known, is virtually an Indian monopoly, and its high price during and after the war greatly stimulated the manufacture of synthetical rival products. The Government of India fearing the fate of the Indigo industry appointed a Commission to investigate the conditions of the industry and make recommendations for safeguarding it. The report of the Commission was issued in 1921, and as a result in 1925 the Indian Lac Research Institute was founded with its headquarters at Namkum, Ranchi (Bihar and Orissa).

The work under review after briefly surveying the Indian lac industry, in which is included its early history and its entomological aspect, gives an account of the areas of major importance in lac cultivation and the uses of shellac. The synthetic substitutes of lac are discussed in detail, and a short chapter is devoted to the necessity for research. The foundation and work of the Lac Research Institute at Namkum are discussed in detail in a later chapter. In connection with the latter a full account is given of the bio-chemical, chemical, physio-chemical and entomological research at the Institute. A detailed bibliography is added and a glossary explaining the terms used in the work is appended. Detailed statistics of lac production in Assam, Burma and countries outside India are also given and the question of the future of the lac industry in the country is discussed in detail.

The work, which is well written and fully illustrated, is very opportune and should serve as a work of reference hereafter.

B. P.

V. THE FAUNA OF BRITISH INDIA, INCLUDING CEYLON AND BURMA. Reptilia and Amphibia. By Malcolm A. Smith. (Vol. II. *Sauria*, pp. i-ix, 1-440, 1 pl., 2 maps, text-figs. February 1935, London.) Published under the authority of the Secretary of State for India in Council and edited by Lt.-Col. R. B. S. Sewell, F.R.S. Taylor and Francis, 30 shillings.

In my review of the first volume of the series (*Journ., Bombay Nat. Hist. Soc.*, xxxv, p. 881, 1932) attention was directed to the great improvement effected by Dr. Malcolm A. Smith in his revision of a part of Boulenger's

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work published in 1890. The same high standard has been maintained in the treatment of lizards, which form the subject matter of the second volume.

In the introduction the author gives a short but succinct account of the structure of the animals, with particular reference to the skin, the teeth, the salivary glands, the tongue, the cloaca, the femoral glands and the eggs. The changes in colour and colour-patterns are briefly described and a note on the fragility of tail is also added. The phenomena of evolution and devolution are illustrated by reference to the diversities in the structure of the adhesive digital pads, the eyes, the limbs, the digital characters and the degree of degeneration of the ear. Attention is also directed to the partial or total degeneration of limbs and to the probable significance of the digital characters. Reference is made to the close affinity which certain Indo-Chinese and Malayan lizards have with forms that inhabit Southern India and it is pointed out that no satisfactory explanation has so far been given for this discontinuous distribution of the species. Skins of lizards are now extensively used for making leather and Dr. Smith gives very useful information on the subject under the section entitled 'Economics'. For non-technical readers the hints under 'Preservation and Examination of Specimens' and 'Measurements' should prove very useful.

The systematic account of lizards contains a description of 297 species, 248 of which are from the Indian Empire. Much valuable information is included under each species and the workers on the group will always be indebted to the author for indicating, so far as possible, the type-localities and the present location of the types of the species treated. The work is full of notes based on personal observations and much biological information has been collected from other sources as well. The volume is fully illustrated. In short, for the present-day needs of taxonomic workers, museum curators and amateurs the work is most helpful and the author is to be congratulated on this production. The next volume on 'Snakes' will be awaited with considerable interest by Herpetologists in particular and naturalists in general.

S. L. H.

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MISCELLANEOUS NOTES.

I.—A NOTE ON THE DISCOVERY OF *PIPISTRELLUS MORDAX* (PETERS) THE GRIZZLED BAT IN CEYLON.

Amongst a small collection of Pipistrelles sent down to me during 1933 by Mr. A. C. Tutein-Nolthenius from West Haputale, Ohiya, were two specimens of a bat that I had not previously seen in Ceylon. At first, I was inclined to believe that they were representatives of a new species, but as neither of them were good specimens I laid them aside until further specimens should be forthcoming. Later, as no others were then obtainable, I forwarded them to the South Kensington Museum, together with a few specimens of other species, for the opinion of Mr. M. A. C. Hinton.

In the meanwhile, however, on my return from leave in England, Mr. Tutein-Nolthenius forwarded to me a further complete specimen of the same species that he had caught in his bungalow. This, after careful study, confirmed by comparison with a specimen very kindly sent down to me by the authorities of the Bombay Natural History Society, I find to be an undoubted specimen of the Grizzled Bat, *Pipistrellus mordax* (Peters).

The type-locality of this species is given as Java, but the only existing Indian specimens have been obtained from Kumaon, Calcutta, Darjeeling and Kurseong (6,000 ft.) in the Eastern Himalayas, so it is of great interest to find that the species is also resident in Ceylon.

West Haputale, Ohiya, where it was found by Mr. Tutein-Nolthenius is in the highest part of the Central mountain cluster of Ceylon, the bungalow being at an altitude of 6,000 ft.

As only three specimens have been secured in spite of careful search, and as it has not been found previously, it would appear that the species is confined in Ceylon to the highest hills and that it is not at all plentiful.

The occurrence of Himalayan species in Ceylon is not unusual, a number of the mountain forms in Ceylon being very closely allied to, if not identical with, Himalayan forms; but it is curious that, in a number of instances, no similar or allied forms have yet been found in the Nilgiris. It is quite likely, however, that when the fauna of the higher South Indian mountains is better known, some of the species that at present have been recorded only from Ceylon and the Himalayas will be found in the intervening mountain tracts.

COLOMBO, CEYLON. W. A. A. PHILLIPS.

January 23, 1935.

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II.—TIGERS IN THE SUNDERBANS.

I enclose the measurements of a Sunderbans tiger which I shot on the 28th December. I have heard that at one time you were anxious to collect data regarding the tigers of the Bengal Sunderbans, which seem to show very definite traits as a distinct race. It is a very different animal from the tiger of the Bengal duars (Terai).

As you know the Sunderbans tiger is a born man-eater and a source of endless trouble and inconvenience to us Forest Officers. Last year alone, there were 45 deaths of forest coolies attributed to tigers. We pay out high rewards to professional shikaries for the destruction of tigers, and since last March have received between 30 and 40 skins and skulls of tigers destroyed.

The skulls are usually destroyed, and are often sent in bad condition by the shikaries, but if you are interested, I can probably get some good skulls for you.

The tiger whose measurements I enclose was shot by me from my steam-launch at 4-30 p.m. on the 28th December 1934. At the time it was swimming across the Betmore Khal, a channel about ¼ of a mile wide. I shot the tiger through the head and killed it dead, and the body floated quite buoyantly. The tiger was a typical Sunderbans animal, an old male in good condition, short and stubby, with a heavy barrel-shaped body, and a coat of rather a pale tawny colour.

If the Sunderbans tiger are of any special interest to you, and if you think I can collect any specimens or data of value, I shall be glad to hear from you.

SUNDERBANS FOREST DIVISION,
KHULNA, BENGAL.
January 4, 1935.

T. V. DENT,
I.F.S.

[The measurements given by Mr. Dent of the tiger shot by him are as follows:—

Body Length (over curves)	9′
,, ,, (between pegs)	8′ 8″
Tail	2′ 10″
Height at shoulder	34½″
Girth behind shoulder	43½″

Mr. Pocock in his recent article on Tigers (*Journ., Bombay Nat. Hist. Soc.*, vol. xxxiii, p. 505) has shown how little is really known as regards variation among tigers in India due to age, season or locality. To arrive at any definite conclusions regarding such variation it is necessary to examine properly sexed skins and skulls obtained at different seasons from different parts of the country. The peculiar conditions under which tigers live in the Sunderbans may produce variation sufficient to differentiate them from tigers found in other parts of India. But without adequate data it is impossible to say whether such variation occurs, or if it does, to indicate its extent. We therefore gladly avail ourselves of Mr. Dent's offer to collect material from the Sunderbans and would

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welcome any notes that he can send us. We should also like to take this opportunity of once again drawing the attention of members to the need of obtaining skins and skulls of tigers from other parts of the country. We are aware that sportsmen do not usually part with such trophies but there may be many occasions when such contributions to our collections may be possible.—EDS.]

III.—TIGER KILLING SOLITARY BULL BISON (*BIBOS GAURUS*).

In the past six months three fine solitary bull bison have been killed by tiger on the Billigirirangans: all carried good and old heads.

Previous to this I have only known of four actual kills of solitary bulls (in twenty years) and of several unsuccessful attacks.

HONNAMETTI ESTATE,
ATTIKAN P.O., *via* MYSORE.
January 3, 1935.

R. C. MORRIS,
F.Z.S., F.R.G.S.

IV.—TIGERS BURYING THEIR KILL.

As it has been questioned as to whether tigers sometimes bury their kill in Burma or not, I venture to record an interesting case that came to my notice in the Bhamo District.

A natural kill of a sambhur was reported to me, and I hurried off to see it. The sambhur had been killed, and dragged into a depression among long grass, but the villagers had taken the meat; and when I saw it nothing much remained. The man who showed me the kill then told me that the tiger had last night removed the few bones that had been left, and had buried them nearby. We went to see. About 20 yards out in the forest and under some teak trees I came across a considerable mound—perhaps three feet high, and of diameter about six feet across. It had been undoubtedly made by the tiger for his claws and pugs showed how he had scraped up the heap most clearly—just as if it had been raked up into a heap with a garden rake! It consisted of various debris to be found around, earth leaves, sticks, stones etc.—but what was most remarkable was that *a thick bough of a tree had been placed on top and right across it all*, as if to keep the whole down securely. There were no man tracks, or signs of man about, and I had little doubt that it was the tiger who had done this. The Burman with me assured me it was the work of the tiger. The bough was about eight feet long and about six inches in diameter—quite a weighty affair.

From under the heap came sufficient smell to leave no doubt about what was there. I did not disturb the mound.

That night I sat up in a teak tree over the mound. Rain began to fall slowly and it was very difficult to hear anything as the raindrops fell on the wide teak leaves. When it was quite dark I thought I detected a slight sound in the vicinity of the heap—then there was a sudden rush and the sound of the log of wood cast aside.

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Nothing else happened. In the morning I examined the place carefully. The log had indeed been cast aside and was now lying about three feet away from the heap!

It must have been the tiger, but he had been scared by my presence and had plunged away. The fact that he had removed the log was sufficient proof to me that *he had himself placed it there* in the first instance. Tigers in Burma are excessively shy of anything in the shape of a trap, and had a man placed the log over the heap the tiger would most certainly not have dared to touch it.

TAUNGGYI, SOUTH SHAN STATES,
BURMA. T. R. LIVESEY.
March 29, 1935.

V.—HOW TIGERS KILL THEIR PREY.

In Burma all the buffalo I have seen killed by tigers had been hamstrung—the hocks, or one hock, crushed by a bite. I think this is invariably the way they kill buffalo, bison and tsaine in this country. In this way they do not risk an injury from the horns of the beast attacked. Burmans who have actually witnessed such attacks on their village buffaloes describe it as taking place in this manner, but they add that once the tiger has been able to roll the buffalo over by this crushing of the hock, he attacks, not the neck, but the belly. This is ripped up and causes death. I can quite believe this, as the neck of these large animals is too thick and massive for a tiger to bite into and reach a vital part, and besides there is the danger of injury from the horns and forefeet of the fallen prey. Neck bites are probably taken after death.

Do tigers and lions ever kill their game with a blow from their fore paw? I believe that they never do, and that they are quite incapable of delivering a powerful blow in this manner. It would seem to be against all reason, for they seek to grasp their game, not knock it away from them!

Kills never show such broken bones and bruises as would result from killing by blows.

It is constantly stated in popular articles that they do kill by a blow. Recently Major Forhan in the *Illustrated Weekly of India* stated in an article on the man-eaters of Tsavo that a man had been 'obviously killed by a blow' but gave no further details to substantiate this astonishing statement.

In the old days the Rajput princes used to sew up the mouths of tigers and cut off their claws, and then wrestle them with men. Sir Pertap Singh used to tell us so. If tigers could deliver a death blow the men would have been killed. The whole point of such contests was that man and tiger fought on equal terms.

TAUNGGYI, SOUTH SHAN STATES,
BURMA. T. R. LIVESEY.
March 29, 1935.

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VI.—NOTE ON THE RECORD INDIAN LION (*PANTHERA LEO PERSICA* MEYER).

What is believed to be the record Indian lion was shot in the Gir Forest of Junagadh by Lord Belper on 8th March 1935. It was carefully measured between pegs and showed a length of 9 ft. 9½ in. The previous record, at least for the Gir Lion, is believed to have been 9 ft. 7 in.

JUNAGADH. P. R. CADELL.
April 9, 1935.

[The largest Indian lioness measured 9 ft. 5 in. (Rowland Ward 1928 Edition.)—EDS.]

VII.—ANTI-RABIC TREATMENT OF AN INDIAN LION (*PANTHERA LEO PERSICA* MEYER).

On 15th March 1935, a dog entered the Sakar Bagh in Junagadh, where a number of Gir lions are kept in captivity, and, after biting two local dogs, ran up to the bars of the open air compound of the cages in which the lions are kept. Sultan, a six year old lion, rushed to the bars to have a look at the dog which promptly bit upon the muzzle. Those who saw the incident agree that Sultan did not bite or strike at the dog, which however collapsed. A gun was procured and the dog was shot. It was almost certainly mad. When the matter was reported orders were issued for anti-rabic serum for animals to be obtained, but, as there seemed likely to be some delay in getting it, it was arranged for the lion to be inoculated with the serum kept in the local hospital for the treatment of human beings. An ingenious arrangement was prepared by Mr. E. A. Alton, Motor and Aeroplane Officer, whereby Sultan, having been induced to enter a small cage, was cooped at one end of it by a movable board. The serum was then injected by Mr. G. B. Fernandes, Veterinary Surgeon, in the loose skin below the belly. Sultan was allowed, after the injection, to return to his own cage. He did not appear to feel the prick of the injection, and entered the small cage daily without objection till the treatment was completed. The daily dose given was 10 cc. i.e., double the normal dose for a human being. No signs of rabies have appeared.

JUNAGADH. P. R. CADELL.
April 9, 1935.

VIII.—ABNORMAL DENTAL GROWTH IN A RAT.

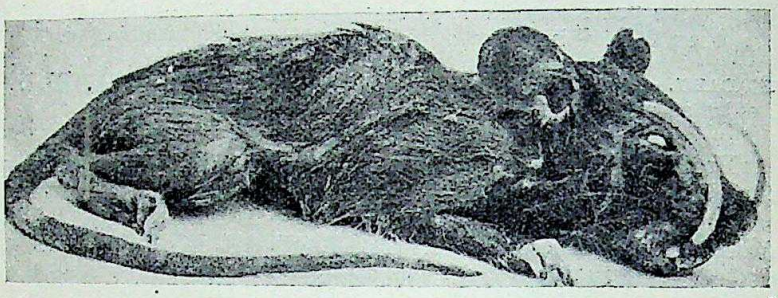
(*With a photo*).

At Paungde (Burma), in the course of energetic trapping during the plague season of 1932, a rat attracted special attention by the size of its teeth which prevented its entry into the trap. A photograph of this rat was exhibited at a meeting of the Zoological Society of London on May 17th, 1932. The comparative rarity of

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the condition and the special features associated with it, together with the fact that neither the photo nor description has yet been published, render desirable a record of this case of abnormal incisor growth. The rat was identified as *Rattus norwegicus* (Erxleben 1777).



Abnormal teeth in a rat.

The length of the body was 4.5 in., that of the tail 3.75, and that of the hind-foot 1.25. The inferior lateral incisors have grown in a more or less, semi-oval shape successively turn upward, backward, and slightly outward. In their first quarter, they enclose and come in apposition with the lateral aspects of the front part of the upper jaw including the nose, and lie free in the rest of their course. When viewed from the front the upper jaw appears to be wedged in between the lower parts of the pair of 'tusks'. Each individual tusk is approximately 3.5 cm. in length and 2 mm. in diameter at its base: in cross-section the base is circular but, as the tusk tapers to a point, it becomes flattened. The pair of central incisors is also abnormal, each being approximately 1 cm. long. In addition a stump of an old broken tusk can be seen.

As a result of these abnormal dental growths the facial appearance of the animal is considerably altered. The upper jaw is separated from the lower by a gap of 8 mm., the mouth being closed by the dental bars like a prison gate.

The abnormal growth of rodent incisors is reputed to be of common occurrence, but rarely do we find such abnormal features as the present example. What causes this abnormal growth? Cases of abnormal growth of human incisors are known. The factors which produce these may also be responsible for the formation of abnormal rodent ones, though to a greater extent. Close apposition of two sets of teeth keeps their size within normal limits: loss of that apposition, for any reason, reduces or prevents wear. Further, the mechanical features associated with mandibular movements cause the dental outgrowths to take the direction of greatest mechanical advantage. Whether the abnormal dental direction, resulting in abnormal dental growths, is the outcome of a congenital malformation, or of an acquired traumatic or other pathological condition, cannot be definitely stated. The lack of any evidence of trauma or disease favours the probability of the condition being congenital. Whatever the original causative factors;

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that the resulting condition must have profoundly affected the dietetic habits of the animal is obvious, the animal not only being deprived of the important cutting function of the teeth, but also having to encounter great mechanical inconvenience in biting and mastication: this is the explanation of its emaciated appearance.

PAUNGDE, BURMA. R. L. SONI,
February 23, 1935. M.B., B.S.

[The specimen has since been submitted to Sir Frank Collyer, Royal College of Surgeons, London, whose report is awaited.—EDS.]

IX.—BIRTH OF AN ELEPHANT CALF (*ELEPHAS MAXIMUS* LINN.).

During a shooting trip at the end of last year, at Christmas, my friend Mr. N. H. Dendy of Tillicoultry Estate, Lindula, came across something so unusual and interesting that I think it should be recorded in the *Journal*.

Mr. Dendy was camped near the Menik Ganga, the river, one of the natural boundaries of the Yala Wild Life Sanctuary, soon to be declared the first Strict Natural Reserve in Southern Province, Ceylon. One morning quite early Mr. Dendy and his men walking along the high river bank, disturbed and watched a cow elephant and her calf.

After about half an hour the mother and calf moved away slowly into the dense forest along the river. The men remarked that the calf could not possibly be much older than a day or two. They had never seen so small a calf.

Going further, something red on the sands drew their attention and going down to look, they found the perfectly fresh placenta of the elephant. Knowing the elephant's habits, this must be a most rare experience and it would be of interest to know if this has ever been recorded before. It was early in the morning so the sun was not high enough up yet to shine and dry it. A certain proof the elephant had calved that night or even, and I think more likely, only a few hours before the party reached the place. It is known that an elephant calf is able to get up and follow the mother about two hours after birth, while various authorities state that the elephant eats the placenta.

At any rate it must be extremely rare to find it, as the sun would soon dry it up, if jackals, crocodile, etc. had not made away with it. The very exceptional drought this poor country has suffered from so severely, no doubt made the elephant choose this unusual place for the calving, knowing that the pools left in the river, were the only water she could get within miles. As a rule the elephant mother chooses the most dense cover she can find, which is all the more reason few, if any, have ever come across so remarkable a find in the jungles and wilds.

In the sand, Mr. Dendy and his men could see clearly the place she had laid down to give birth.

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Mr. Dendy estimates the total weight of the placenta at about 5 to 6 lbs. The far side, darkly coloured, consisted more or less of solid flesh, the lighter coloured and a small patch on the right, was like frothy blood. Much to the surprise of Mr. Dendy, after some hesitation, the excited men asked if they might take it, they explained that when washed and dried, the solid part would make a very valuable and excellent medicine. It is said that a small bit of the dried substance, dissolved in a little lime juice and water, will at once relieve a woman's labour pains, or will help to advance an overdue confinement.

All folklore is of great interest, but considering the so great rareness of ever finding the placenta of a wild elephant, this bit of jungle lore is all the more unique.

Both men, as well as others who have spent their lifetime as watchers in the sanctuary and the neighbouring reserve, had never seen the placenta and knew of no one who ever had. The two men with Mr. Dendy had never come across the calving place of an elephant, a very rare thing to find. And yet, handed down for generations, they one and all knew the story of this most valuable medicine.

It was not quite clear from the impressions in the sand, to be quite certain about the position the cow elephant had occupied, but in all probability she must have been lying on her right side, her back turned towards the place where the men are standing.

In this connection it is of interest to remember the photograph of a cow elephant which died in calving, published in 'Kill, or be killed', by Major W. Robert Foran. This photo clearly shows the animal lying in the kneeling position. I have not been able to find any authority who describes the true position the elephant calves.

It would be of interest to know if any one has ever come across so rare and unusual a find as described above.

West Haputale,

Ohiya, Ceylon. A. C. TUTEIN-NOLTHENIUS.

April 9, 1935.

[G. H. Evans in his work on *Elephants and Their Diseases* describes the birth of an elephant calf on information obtained from an experienced Burman—'When about to give birth the female seeks soft ground. The calf may be presented head and fore feet or the hinder parts may appear first. If the membranes are not ruptured by an attendant, the female does so with her foot. The young one lies from one to two hours after birth, occasionally moving ears, trunk, limbs, after which it gets on its legs and can walk. Elephants even in the wild state may die in labour—the author records an instance. A newly born calf can walk well enough after a few days to follow the mother on a short march, and in the wild state, when a calf has been dropped, the herd remains in the vicinity until it is able to follow the mother; which is generally in about 48 hours. The author is of opinion that the 'after birth' is usually eaten. It comes away 15 or 20 minutes after the birth of the calf.—Eds.]

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X.—GROWTH AND SHEDDING OF ANTLERS OF SAMBUR AND SWAMP DEER IN ASSAM.

In No. 3 of vol. xxxvii, I saw a note about 'Growth and Shedding of Antlers in the Swamp Deer (*Rucervus duvaucelli*) in Manipur State'.

I saw Swamp Deer in Assam, along the border of Bhootan and along the foot of the hills, in spring, 1892 and also some of the poorly horned Sambur of that area.

On the 8th of March, I shot a sambur with horns fairly worn out by rubbing against the grass. The same day, I saw another one with horns hardly half grown and, of course, in velvet.

On March 14th, at a place ralled Raimana, a large Swamp Deer had horns half grown, in velvet, with the brow tine fully developed and the fork above showing the beginning of the other tines.

On March 18th, another Swamp Deer appeared to me to have tines almost fully grown except the top ones.

On March 21st, I shot a fine Swamp Deer, at a place called Kochugaon. His horns were still in velvet but fully grown, just the tips of the top tines were still a bit soft and rounded. By a strange piece of luck, from the back of my elephant, I saw a shed horn in perfect condition on the ground which the elephant picked up for me. It was only a few hundred yards from the place where I had shot the stag and, to all appearances, must have been one of the very same stag. I kept it, and was sorry that it was not on the stag at our meeting.

I consider that the beginning of the rains is probably the time when the Swamp Deer in Assam are in their prime. This would show a difference of season to that of Manipur, but this may vary from one place to another according to the locality.

MONTEVRAN, CHAUMONT-SUR-THARONNE,
LOIR-ET-CHER, FRANCE. VISCOUNT ED. DE PONCINS.
January 10, 1935.

XI.—SOME LITTLE-KNOWN BIRDS OF NORTHERN BURMA.

I have already recorded in the *Ibis* of January 1935 the occurrence of the birds mentioned below in the Myitkyina District of Upper Burma. As the records are so few and far between, the following additional notes made in the District in 1934-35 are possibly worth recording.

Psittiparus g. gularis. Grey-headed Parrot-bill.

The only published Burma record is of one obtained by Capt. W. M. F. Gamble at Tutuga (Myitkyina District) in January 1933. A male was brought to me by an Atzi at Sadon on December 21st 1934, obtained at about 3,500 ft. with a pellet bow, in bamboo (iris red brown, bill orange-yellow, legs slaty-green).

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Ciconia nigra. Black Stork.

This is probably an annual visitor to the upper reaches of the Irrawaddy, as I saw two large gatherings on sandbanks in November 1934, one being in exactly the same place as I observed them in November 1933.

Ardea imperialis. Great White-bellied Heron.

I again found this bird by no means uncommon between Sinbo and Myitkyina in November 1934. Individuals were seen at various places along the river and were not at all shy, feeding close to villages, and allowing a launch to approach quite near to them, before they took to flight.

Podiceps c. cristatus. Great Crested Grebe.

There are two previous recorded occurrences of this Grebe from the District but very few Burma records otherwise. On November 20th, 1934, I saw one on the river a few miles south of Myitkyina, and shot one of a pair on the Hokat jheel still further south. On November 21st I saw one swimming with a party of cormorants near Sinbo.

MYITKYINA,
UPPER BURMA.
December 21, 1934.

J. K. STANFORD,
Indian Civil Service.

XII.—MATING HABITS OF MYNAHS AND CROWS.

Between January and March, I had occasion to observe the pairing habits of certain birds. My attention was attracted by the extraordinary noise made by some Common Mynahs (*Acridotheres tristis*). To me, it seemed, that a pair of them were in a deadly combat. I watched them from a distance. A third one suddenly appeared on the scene but it remained an indifferent spectator. The interesting aspect of the combat was, that though the participants could have separated and taken to wing they continued the struggle. Each fiercely pecked at the other's beak, legs, wings or body. Finally the combat ended. The birds lay by each other with their vents apposed. This continued for about 15 seconds, then they parted and flew off.

It was then, I concluded that the strenuous combat may have been only a method of courtship or 'love play' and the apparent rest they took was actual copulation.

I was able to watch the behaviour of some mynahs two days later when two pairs were through a similar performance. They began their 'fight' on the branches and the house-tops and finally fell to the ground in the course of the combat. What I presume was that copulation took place during the 10-15 seconds of quiescence which followed. The whole performance was repeated at short intervals.

It is interesting to compare this habit of mynahs with the normal pairing habits of birds. The same method is apparently adopted by crows. Coitus is presumably effected side by side with

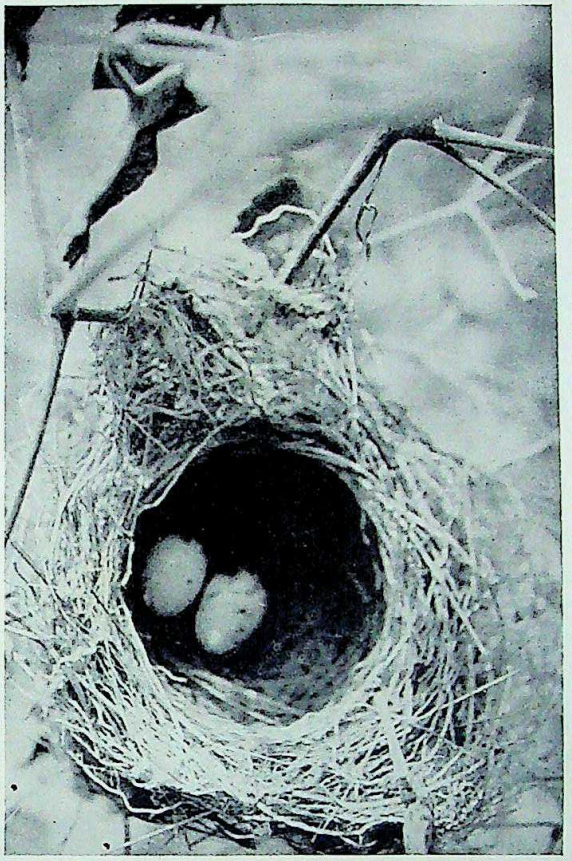
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Ramsay's Bar-wing (*Actinodura ramsayi*). The Bird in the nest.



Nest and eggs of Ramsay's Bar-wing (*Actinodura ramsayi*).

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the vents apposed, which, if my conclusion is correct is in contrast to the normal position of other birds such as sparrows, kites, etc.

It is interesting to note that the observations suggest two different ways of pairing in birds.

MEDICAL COLLEGE, K. I. VARGHESE, M.A.
VIZAGAPATAM.
February 18, 1935.

[There is a general belief that crows copulate in the manner suggested by the writer of the note; colour is lent to this belief by the frequent combats which take place between crows during the period which immediately precedes their breeding season and also by the fact that copulation is rarely observed. However, on the rare occasions when it has been observed, the act was performed in the manner normal with birds. Mr. Salim Ali has made such observations and has seen crows pairing usually early in the morning. We do not therefore consider that we have any real evidence in support of the popular belief that there is a deviation from the normal in the mating habits of crows, nor do we consider that the writer of the above note is justified in his conclusion that the combats between mynahs are a preliminary to mating or that coitus takes place during the brief period of quiescence which follows a combat. Unless some pairs are actually shot in the act of scuffling and sexed and the passage of the male sperm ascertained by microscopic examination one could not accept the evidence offered by Mr. Varghese as conclusive. It is more than likely that the scuffles which take place among these birds are between rival pairs, both males and females sometimes join in the mêlée. Mr. Salim A. Ali in a recent letter to the Society mentions that he has seen several pairs of mynahs mating in the ordinary manner and that he hopes to collect further evidence on this point. We hope that Mr. Varghese will continue his observations regarding the mating habits of these common birds.—EDS.]

XIII.—NIDIFICATION OF THE SHAN STATES BAR-WING [*ACTINODURA RAMSAYI RAMSAYI* (WALDEN).].

(*With a plate*).

As the nidification of this bird remains still undescribed, I send you a note and photographs of a nest found by me two years ago.

It was on April 11, 1933, that I found the first nest of this Bar-wing, in the Southern Shan States, up in the hills at Sintaung, some twelve miles south of Taunggyi. The elevation above sea-level would be about 5,500 ft. That locality is particularly beautiful, wild rocky peaks rising to nearly 7,000 ft., with open down lands and ravines, patches of thick forest and green glades between. The local hill tribe are the Taung-yos, and they know a great deal about their birds. To them this Bar-wing is known as 'Nget pi pi'—presumably from its loud call note.

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I was resting by a cave and waterfall, by the side of a rocky, scrub-covered hill, when I noticed a Bar-wing with building material in its bill fly up into a lot of creepers overhanging some rocks. But on searching the creeper carefully I could not see any signs of the building nest. The creeper was not a dense one, but somewhat dried-up, and yellow, with a good deal of feathery, 'silk' on it. I returned in five days' time, and to my delight, the birds were there. The nest I could now make out built very slenderly out on the edge of the creeper amongst the 'silk'. As the bird was still sitting on her nest when I got to within three yards of her, I was able to take a photograph of her sitting on the nest. Her tail is seen sticking out over the edge of the nest—long and straight.

There were two eggs—typical Bar-wings—but handsomer ones than those I had previously seen in the Chin Hills.

The nest, suspended in the half-dried-up creeper, hung out some ten feet from the ground over the rocks—a part of the same creeper ascending a thickly foliaged tree near by. It was made of yellowish round roots and was lined with finer ones of the same character. The outer part of the nest had some of the creeper's feathery yellowish-white 'silk' worked into it, so that the nest was by no means easy to distinguish. Had I not known the exact spot I would surely have overlooked it.

The eggs measured approximately 23 mm. by 17.4 mm. They were of a delicate blue-green—the colour we associate with eggs of the English song thrush—but rather paler, and still more beautiful as the shells were of a delicate texture and being so thin gave the eggs a lovely transparency. The markings were few but bold in character—a few blotches and scrolls of purplish chocolate—some of the scrolls being drawn out into hair-lines. There were a few underlying blotches of lilac colour. The markings were mostly situated at the larger end of the eggs almost forming a zone.

Subsequently I saw many more of these Bar-wings' eggs, and they were all of the same type—but there are occasionally some that are weakly coloured, and such eggs approximate somewhat in appearance to a certain type of egg rarely laid by *Leioptila melanoleuca radcliffei*.

It has been said that the Bar-wings are very similar to the Sibias. Morphologically that may be so, but their appearance and habits are different, the Bar-wings being secretive birds, somewhat heavy in flight, and keeping to the lower growth, while the Sibias are elegant and conspicuous birds. But both have sweet and loud musical call notes—tender, pleading and somewhat mournful.

The call note—or is it the song-note?—of this Bar-wing is loud and plaintive and can be heard at a great distance. It consists of six notes falling in cadence—'Pi-pi pi-pi pi-yuuu' the last note being mournful, plaintive and prolonged. There is about two seconds' interval between each double note, and about one second's interval between each 'pi-pi'.

Recently I heard a bird calling in the thick, green jungles 60 miles north of Myitkyina which I took to be a Bar-wing. The

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call was of the same character but consisted of 'Pi-yuu—pi-yuu—pi-yuu'—the intervals being somewhat longer—say four seconds, between each double note.

In future bird books let us hope some attempt will be made to describe with something approaching accuracy the colouration of birds' plumage and their eggs; and also their notes. The former should be described in terms of recognised artists' colours—which are the colours nearest to nature's—and a colour chart, as a guide, published on the front page. Birds do not wear chemically-coloured ladies' dresses! And as to the songs and notes of birds, a proper system is much to be desired. It should not neglect to give the approximate intervals between notes as such are very characteristic of the different species of birds.

TAUNGGYI, SOUTH SHAN STATES,
BURMA. T. R. LIVESEY.
March 17, 1935.

XIV.—NIDIFICATION OF THE BLACK-HEADED BABBLER [*RHOPOCICHLA A. ATRICEPS* (OATES)].

With reference to Capt. Bates' letter on the nidification of the Black-headed Babbler (*Rhopocichla a. atriceps*), I am pretty sure that Davidson was right in stating that this bird builds 'cock' nests which are never intended for breeding purposes. Wherever the species occurs one finds dozens of these nests in the jungles at all times of the year. They are very loosely and untidily constructed, usually in full view and I have never seen one with any lining. Dead bamboo leaves are the favourite material and I found one beautiful specimen made entirely of skeleton leaves. Though I have disturbed birds roosting in this type of nest, all those which I have found containing eggs or young have been much smaller and more neatly and firmly woven. Unlike the 'cock' nests they are usually very well hidden and have a lining of black rootlets or grass. While, as Bates says, one may find half a dozen of the former type in as many yards of thicket, the breeding nests are usually quite isolated. The Ceylonese sub-species *nigrifrons* has precisely the same habits.

COOVERCOLLY,
SOMWARPET, COORG. F. N. BETTS.
December 31, 1934.

XV.—ON THE OCCURRENCE OF THE TIBETAN SISKIN [*SPINUS THIBETANUS* (HUME)] IN NORTHERN BURMA.

In the *Ibis*[1] for April 1935 I recorded the occurrence of this rare finch in March 1933 near Sadon in the Myitkyina District at about 3,000 ft. Prior to this, it had only been known in India from the Tibet-Sikkim border, and in Burma from three obtained by Lord Cranbrook at 6,600 ft. in the Adung Valley (in the far

[1] *Ibis*, 13th Ser. Vol. V, p.265.

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north of the Myitkyina District) in March 1931. On December 20, 1934, I obtained four out of a flock of about 20 birds in the valley of the N'Gri Hka about 6 miles west of Sadon, at a height of about 2,000 ft., one of which I was unable to preserve. They were all singing together with a typical Siskin note, in a tree after bathing in the stream. Two of those obtained, sexed as females, were heavily striped on the upper parts. (Iris, brown; bill, bone-grey; legs and feet, vivid brown.)

MYITKYINA,
UPPER BURMA.
December 21, 1934.

J. K. STANFORD,
Indian Civil Service.

XVI.—VULTURES FEEDING AT NIGHT.

On December 15, 1934, while Mr. and Mrs. P. Learoyd of Ootacamund were sitting up over a tiger kill at the foot of the Billigirirangans, vultures descended from the surroundig trees at about 8 p.m. and by 11 p.m. had completely demolished the remains of the kill. Although it was moonlight, I cannot recall a similar case having occurred before.

HONNAMETTI ESTATE,
ATTIKAN P.O., *via* MYSORE.
January 3, 1935.

R. C. MORRIS,
F.Z.S., F.R.G.S.

XVII.—PEREGRINE AND SPUR-WINGED PLOVER.

The delightful note by Mr. Stanford describing the drill-dance and manifestation of the Spur-winged Plover prompts me to tell of a most curious incident I witnessed in Burma a few years ago in which the Spur-winged Plover—the Japanese Print Bird—played an astonishing rôle.

I was slowly ascending the lovely Salween River in Karenni in a small boat, when my attention was attracted by a Spur-winged Plover in a very frenzy of agitation. He had come to the very end of a sand-spit just in front of my boat, and as I came to within about twenty yards of him, *he actually took to the water like a duck and swam out into the river*. He rode the water easily and lightly—with grace. I was dumbfounded at this exhibition! He then suddenly ducked *and dived clean under*! At the same moment there was a tearing sound and a fine Peregrine came at his stoop and skimmed over the ripples where the Plover had disappeared!

After about three or four seconds up bobbed the Plover again on the surface tittering with fear, while the Peregrine looking over his shoulder swung up and round to repeat his stoop. Then he came again at the Plover and as before just when he was within a few yards the wily Plover again dived! By this time my boat was nearly on top of the Plover who bobbed up, and then began to swim ashore. The Peregrine had flown off baffled completely by these tactics. The Plover landed safely and ran along the shore, still very rattled by his narrow escape from death.

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And so I left him there bobbing up and down and shaking the wet off his plumage on a sandy-spit by the Salween.

TAUNGGYI, SOUTH SHAN STATES,
BURMA. T. R. LIVESEY.
March 29, 1935.

XVIII.—DISTRIBUTION OF THE INDIAN HOOPOE (*UPUPA EPOPS ORIENTALIS* STUART BAKER).

On page 308 of vol. iv of the *Fauna of British India* (2nd edition), as an instance of the wandering habits of Hoopoes, *Upupa epops orientalis* is quoted as breeding as high as Sukna in Darjeeling, some 7,000 ft. elevation.

As a resident of the Darjeeling District for many years, I write to say that Sukna is at the foot of the hills at 1,000 ft. elevation and is on the actual natural dividing line between hills and plains with sal forest on the north side and tea and rice fields on the south.

In fifteen years I have never seen any other Hoopoe but *U. c. saturata* in these Hills, which passes through in late August or early September returning in March and April, some birds dallying quite a while by the wayside. The earliest recorded downward date is August 17th and the latest upward date is May 17th when two birds hung about the tea garden for 3 weeks and then suddenly disappeared.

Round Siliguri, some 7 or 8 miles from the foot of the hills I have seen both *U. c. saturata* and *U. c. orientalis* together, in December, the latter being resident.

The reference to Sukna and Darjeeling on page 311 is ambiguous but the reference on page 308 shows that Sukna is assumed to be the same elevation as Darjeeling, thereby greatly enhancing the difficulty of dividing up the sub-species.

NAMRING T.E.,
RUNGLI RUNGLIOT P.O., W. H. MATTHEWS.
N. BENGAL.
March 8, 1935.

XIX.—THE LESSER FLORICAN [*SYPHEOTIDES INDICA* (MILLER)] IN THE KONKAN.

A female Lesser Florican was shot by Mr. J. Stokoe near Karjat at the foot of the Bhor Ghat on Sunday the 20th January 1935. As the Florican rarely enters the area lying between the Western Ghats and the sea, the record is of interest.

BOMBAY NAT. HIST. SOC.,
6, APOLLO STREET. S. H. PRATER,
February 2, 1935. C.M.Z.S.

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XX.—SOME NOTES ON WOODCOCK (*SCOLOPAX R. RUSTICOLA* LINN.) IN BURMA.

The *Fauna* (2nd edition) states that in India the Woodcock is 'merely a casual migrant to the plains, the great majority of the Himalayan birds being resident or merely moving to lower levels in the winter'. Its breeding haunts are stated to be the Himalayas from 8,000-12,000 ft. and the 'mountains of Northern China'.

Mr. E. B. Bloech (*Journal*, vol. xxxiii, p. 715) has shown that the Woodcock is a regular winter visitor to the western edge of the Pegu Yoma in Lower Burma. It certainly occurs regularly in winter at about 3,000 ft. near Maymyo in the Shan States, which is only 26 miles away from one of the driest parts of the dry zone. Mr. E. W. Allan, of the Indian Forest Service, found it common at about 3,000 ft. in the Kyangin township of Henzada District in the Henzada-Arakan Yoma. Capt. E. H. Cooke shot a migrant in the Fort at Mandalay, and I have recorded its occurrence in 1929 in the plains of Prome District. I also once saw a Woodcock, almost certainly a passing migrant, which had been disturbed out of a neighbouring garden, fly over the tennis-court of the Monywa Club on the Chindwin in October or November 1924. Col. R. M. Jacob tells me it is to be found regularly in various parts of the Chin Hills in winter, from 5,000 ft. upwards. These occurrences suggest that it is not a casual, but a regular, winter migrant over a very large part of Burma, to be found from late October to March whenever conditions are suitable. In the Myitkyina District of Northern Burma it certainly occurs, as a winter visitor, in some numbers over an area of 15,000-20,000 miles both in the plains and in the hills. On October 23, 1934, one flew over the Myitkyina Club at dusk, and I saw another flighting at dusk out of my garden in the same week. These were probably birds on migration. Capt. D. M. Fife tells me they occur at Laukhaung (3,000 ft.) in the N'Mai and Ngawchang Valleys and round the Panwa Pass on the Yunnan border (6,000 ft.) from December to mid-February. In January 1935, Messrs. A. S. Vernay, R. C. Morris and myself found a number flighting in every evening to wet ditches and paddy stubble on the edge of evergreen forest near Lonhkin in the Jade Mines. I saw at least three of these birds come high over the trees in the dusk, set their wings and stoop like a snipe or a falcon down to their feeding-grounds, though once they had started to feed they more or less fluttered up and gave very easy shots. In some of these ditches, the marks of their beaks and feet could be seen by day, and indicated where to wait for them. On January 1, 1935, I shot two feeding by day, on the Talawgyi plain, one in dew-covered short grass like wild barley; which at the time was full of feeding snipe, and the other on the edge of a jheel where it was feeding with Fantail and Painted Snipe about 9 a.m. In late February 1935, while we were beating for jungle fowl in scrub jungle opposite Myitkyina, as many as eight were flushed and six shot within a radius of about 300 yds. These birds were lying in dry scrub and bamboo jungle, and their feeding ground was pro-

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bably the mud of a backwater of the Irrawaddy 200 yds. away. In early March, Capt. J. G. Hurrell saw as many as six in one jungle-fowl beat near Myitkyina. I have seen these birds flushed out of quite dry grass jungle by day, but one of their favourite haunts seems scrub or cane-brake jungle where shallow streams run out into the fields. Capt. Lyle tells me he has shot them at Sima (4,000 ft.) flighting to places where springs come out of the hillside. They rarely fly far in a beat and when first flushed, if not shot at, usually pitch again within 100 yds. It is to be hoped that before long the Woodcock will be found breeding in the hills of the North-East Frontier of Burma, on the Tibet or Yunnan border. There must be some breeding area in between the Himalayas and the North China hills which is yet to be discovered.

MYITKYINA.
April 14, 1935.

J. K. STANFORD,
Indian Civil Service.

XXI.—ALBINO FAN-TAIL SNIPE (*CAPELLA G. GALLINAGO* LINN.).

I am sending you under separate cover a white snipe I shot about 20 miles from Bangalore on the 20th instant. I don't know how common such a specimen is but thought it might interest you.

I was shooting the border of a shallow tank where the snipe were fairly plentiful but wild. A couple got up together at extreme range and I fired the left barrel at the leading snipe but missed. I then noticed that the second one appeared completely white. I marked it down about 400 yds. further on and eventually shot it sitting as I didn't want it to escape again! It was very conspicuous, being visible from well over 100 yds. away where an ordinary snipe would have been unnoticed at 20. I apologise for the very bad skinning but I had to do it late at night.

Lt.-Col. J. V. J. Ellis, R.A., who has since gone home, told me about last November that he had seen a white snipe while shooting from Bangalore, but had failed to get a shot at it.

R. A. MESS,
BANGALORE.
January 23, 1935.

H. C. M. DUNN,
Lt., R.A.

XXII.—A SECOND RECORD OF THE OCCURRENCE OF THE LONG-TAILED DUCK (*CLANGULA HYEMALIS* LINN.) IN INDIA.

IN INDIA.

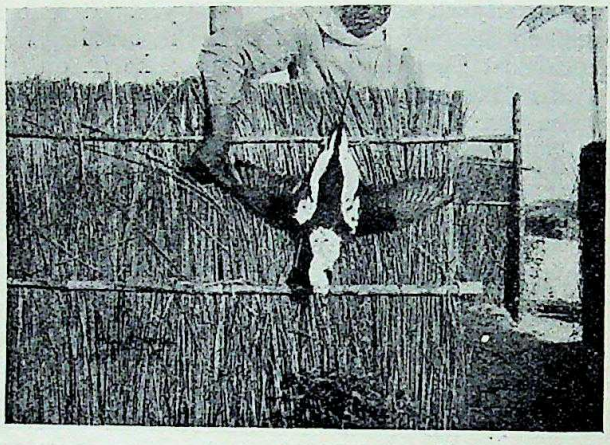
(*With a photo*).

I enclose herewith two photographs of a specimen of a drake Long-tailed Duck, *Clangula hyemalis*, which I shot on a wide sweep of the River Brahmaputra at Messaki, at the western end of the Pasighat Sub-Division of the Sadiya Frontier Tract, on Wednesday the 23rd of January, 1935. I tried to skin the bird,

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but knowing very little of the business and how to preserve the skin, it went bad in the end. I kept one of the long-tail 'pins' however which I also enclose herewith. The other 'pin' was somewhat shorter. I do not think there is any possibility of a mistake in identification for the black and white plumage with the black chest and white abdomen, the long 'pins' in the tail and the pink and black bill (a typical duck's bill) were to my mind unmistak-



The Long-tailed Duck (*Clangula hyemalis*)

able. The bird when first seen was swimming in the water quite close to the boat in which my wife and I were; but it seemed unable to fly. It gave a fine exhibition of diving before it was shot. I killed it thinking it was an injured smew. Later I discovered the apparent reason for its inability to fly, for it was gorged right up to the mouth with small freshwater shrimps. There were two other flocks of duck on the same water of which the males looked black and white and were apparently; the females looked dark brown, through a pair of field glasses. I was unable to get a shot at them for they were very wild. I cannot say therefore for certain if they were the same species as the one I shot, although the black and white birds in the flocks looked the same from the distance. These two flocks were on the same water on 16th February 1935 when I returned to Messaki on the homeward journey of my tour, but although I tried hard to secure another bird, I failed, for they were as wild as ever.

I cannot account for the bird I shot for its presence where I shot it seems very extraordinary indeed. It was very fat and seemed very heavy for its size. It was in splendid condition. Doubt will probably be cast on the record since I see that the duck has only been recorded once before in India and that from Baluchistan, but I think the accompanying photographs will set it at rest.

PASIGHAT, N.-E. FRONTIER,
ASSAM, INDIA.
April 1, 1935.

R. E. PARSONS.
Assistant Political Officer.

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XXIII.—THE OCCURRENCE OF THE SCAUP (*NYROCA M. MARILA* LINN.) IN THE BHAVNAGAR STATE.

Many thanks for your kind information about the duck I sent to you, and which was indentified as the Scaup (*Nyroca m. marila*).

I shot this duck in the last shoot of the season on the 22nd February last, at a place called Hathab, about 17 miles from Bhavnagar along the sea coast. The tank is about a mile from the village and consists purely of rain water. It is very badly situated for a shoot as the sea is about 150 yds. away, only a range of sand dunes dividing the tank from the sea. It has a small patch of reeds, but not thick enough to give any cover. All the ducks after being shot at for a very short time, make straight for the sea and very poor shooting is to be had. For this reason I arranged to have two Peregrine Falcons to 'wait on', so as to keep the ducks in the tank. As a result we shot 35 ducks out of about 100, with 3 guns. I think this is a very good bag considering the bad situation of the tank.

There were many other varieties of ducks, mostly Tufted Pochard (*Nyroca fuligula*) and Gadwall (*Chaulelasmus streperus*).

Another rare duck was shot by one of my friends. This small duck was flying very much slower than the others; its greyish-white colouring made it quite distinctive. It was eventually wounded and secured. I identified it as a female Marbled Teal (*Marmaronetta angustirostris*). It is still alive at our duck house. This species is a rare visitor here only. One male specimen was shot in 1931 at a village called Tarsamya just two miles from Bhavnagar.

NILAMBAG PALACE,
BHAVNAGAR. K. S. DHARMA KUMARSINHJI.
March 10, 1935.

XXIV.—THE BRONZE-CAPPED TEAL [*EUNETTA FULCATA* (GEORGI)] IN THE SAMASTIPUR DISTRICT, BENGAL.

I have sent under registered post today the head of a duck for identification as no one on the shoot could identify the same, some of the Mallahs having been out shooting in this jheel with Planters for more than 50 years. Most unfortunately the young Mallah who picked it up 'hilal-karoed' it, before it was seen by us.

One of my old orderlies called it a Bengal Duck. Mr. E. Abbott of Hathwa who was shooting, has shot on this jheel for over 50 years and has never seen any bird like it.

On this same jheel, a Baikal Teal was shot about 4 years ago.

HURSINGPORE, SAMASTIPUR P.O.,
B. N. W. RY. C. I. PARR.
February 4, 1935.

[The head sent by Mr. Parr was that of a Bronze-capped teal. —EDS.]

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XXV.—OCCURRENCE OF THE MARBLED DUCK [*MARMARONETTA ANGUSTIROSTRIS* (MÉNÉTRIÉS)] NEAR POONA.

On the 15th December 1934, I was duck shooting at Ravengaon Lake 54 miles south-east of Poona, the duck were very plentiful, more so than in the last four years that I have spent in this district. Amongst the duck I shot was a solitary bird which you have since identified as a Marbled Teal (*Marmaronetta angustirostris*). This is the only occasion that I have seen this duck in these parts though I have seen several shot at Khush Dil Khan near Quetta. I was interested to hear that this bird has not been recorded further south than Baroda.

7, Lothian Road,
Poona.
January 31, 1935.

F. C. HICKIE,
Lt.-Col.

[The Marbled Duck is a common cold weather visitant to Sind and is less abundant in the provinces which adjoin it. From this area it occurs as a straggler in other parts of India. In the Bombay Presidency it has been recorded from Gujerat and Kathiawar, but not, as far as we are aware, so far south as Poona.—Eds.]

XXVI.—THE SHELDRAKE [*SARKIDIORNIS MELANOTUS* (PENN.)] AND THE COMB DUCK [*TADORNA TADORNA* (LINN.)] IN SIND.

The Sheldrake or Dunn Duck. One was shot at Bhujo (Jungshai District, Sind) by Major Osborne, Royal Sussex Regiment on the 11th December 1934 (very far south for this duck). One was shot at Badin, Hyderabad District, Sind, between the 24th and 30th December last year by a party consisting of officers of the Royal Sussex.

The Nukta or Comb Duck. One was shot at Mirpur Bothoro, Sind, between the 17th and 20th November 1933 by Major Osborne, Royal Sussex Regiment.

Karachi.
January 21, 1935.

C. B. RUBIE,
Lt.-Col.

[The Sheldrake is a rare visitor to Sind. It has been secured on the Manchar Lake and at Jhunpur on the Khinjar Jheel.—Eds.]

[The Nukta has been previously recorded from the Kati Dhand, Sujawal District (Webb, *J.B.N.H.S.*, vol. xxi, p. 685) and has been obtained at Badin.—Eds.]

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XXVII.—ARRIVAL DATES OF MIGRANT BIRDS IN COORG.

I subpend a list of arrival dates of migrants this cold weather in case they may be of interest.

September	3.	Marsh Harrier.
September	5.	Grey Wagtail.
September	9.	Pintail Snipe.
September	21.	Common Indian Bee-eater (Local migrant).
September	17.	Eastern Swallow.
September	29.	Brown Shrike.
October	5.	Great Reed Warbler.
October	5.	Red Breasted Flycatcher.
October	8.	Black Drongo (Local migrant).
October	10.	Indian Oriole (Local migrant).
October	16.	Indian Pitta (Local migrant).
October	17.	Black-headed Cuckoo Shrike (Local migrant).
October	17.	Blue-headed Rock Thrush.
October	18.	Indian Blue Chat.
October	19.	Forest Wagtail.
October	26.	White Wagtail.
November	3.	Indian Tree Pipit.
October	26.	Verditer Flycatcher.
November	23.	Hoopoe (Local migrant).
December	2.	Yellow-Throated Sparrow (Local migrant).

Most species were a week or so later in arriving this season than usual.

COOVERCOLLY,
SOMWARPET, COORG. F. N. BETTS.

December 31, 1934.

XXVIII.—AN ADDITION TO THE LIST OF SNAKES OF BOMBAY AND SALSETTE: *CORONELLA BRACHYURA*.

I am sending you under separate cover a specimen of *Coronella brachyura* which I recently obtained at Marole, in Salsette Island. This species is not listed in Mr. Prater's *Snakes of Bombay Island and Salsette*.

Another snake that does not appear to have been recorded from our Island is *Typhlops acutus*. There are two specimens of this snake in the collection at St. Xavier's College, Bombay, one obtained by Mr. C. McCann at Tulsi, and the other by myself at Andheri.

Trimeresurus anamalensis is recorded as 'straying into Mahim wood' by Vidal (*J.B.N.H.S.*, v, p. 65). Does the specimen exist? or is it to be considered as a result of confusion with *gramineus*?

GODREJ HOUSE,
ANDHERI. HUMAYUN ABDULALI.
April 23, 1935.

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[*Coronella brachyura*, a rare snake has hitherto been recorded only from the Deccan. Its discovery in Salsette indicates an extension of its range into the Konkan. It is probable that Vidal's record of the occurrence of the Anamalay Viper *T. anamalensis* in Mahim is the result of a confusion with the Common Green Pit Viper (*T. gramineus*). The latter is found in the hills of Salsette. One was killed at Malabar Hill, Bombay, where it was found in a grass cart. Snakes are sometimes imported in this way. There is in the Society's collection a hatchling of a Malay Python (*P. reticulatus*) which was killed while unloading teak from a ship in the Bombay Docks.—Eds.].

XXIX.—A FURTHER LIST OF SNAKES FROM AHMEDNAGAR.

In continuation of my note on 'Snakes at Ahmednagar,' published in the *Journal of the Bombay Natural History Society* on 15th November 1932, this note is sent, which covers a period of about 14 months, from 8th June 1932, on my return from leave, to 3rd August 1933, when I was transferred to Belgaum as Civil Surgeon. During this time an additional number of snakes was seen by me—230 from the Town and District of Nagar. This brings the total number of snakes seen from this district, including those mentioned in my previous note, to 479 and hence is useful as a general index of the variety of snakes found in this part, the number being sufficiently large for this purpose. Out of the 230 snakes, 39 were from Visapur, 36 from Newasa, 6 from Jamkhed, 3 from Shevgaon, 2 from Parner and 1 from Toka, in Ahmednagar District.

The snakes were:—

1. The Common Blind Snake (*Typhlops braminus*)—9. 8 of these were found in my (Civil Surgeon's) bungalow.

2. The Red Earth-Boa (*Eryx conicus*)—11. 6 of these were from Nagar and 5 from the District. The longest was 2 ft.

3. Python (*Python molurus*)—1. This was 7 ft. long and was brought from Kharda in the District and was seen with a snakeman.

4. Checkered Water-Snake (*Tropidonotus piscator*)—7. 6 from the District and 1 from Nagar.

5. Buff-Striped Keel-back (*Tropidonotus stolatus*)—1. A complete cast skin of this snake was seen.

6. Green Keel-back (*Macropisthodon plumbicolor*)—49. 27 from Nagar and 22 in the District. In my last note I had mentioned 32, so it is quite a common snake (81 out of 479). The hatching period of this snake seems to be the month of June as young specimens 7 in. and 8 in. long were commonly seen in June and July.

7. Common Wolf Snake (*Lycodon aulicus*)—28. 22 from Nagar and 6 from the District. Another common snake (76 out of 479). A brood of 6 young ones, about 8 in. long, was found in one of the rooms of the Ahmednagar Club on 22nd May 1933.

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8. Dhaman (*Zamenis mucosus*)—12. 9 from Nagar and 3 from the District. The longest was 8 ft., another being 7 ft. 8 in.

9. Fasciolated Dhaman (*Zamenis fasciolatus*)—5. One from Nagar and 4 from the District, all from Visapur, where this seems to be a common snake.

10. The Spotted or the Graceful Dhaman (*Zamenis gracilis*) —4. 2 from Nagar and 2 from the District.

11. The Trinket Snake (*Coluber helena*)—22. A common enough snake (total number 56). 16 were from the Town and 6 from the District. In the Town of Nagar this is a common snake. The longest was 50 in., some other big ones being 47½ in., 46 in., 44 in. and 42 in. One 38 in. long was seen on the ledge of the deep well in my compound, about 4 ft. from the surface of the water and was brought up alive, entangled on lowering some small branches of the ordinary Ber tree on a rope, on 8th December 1933.

12. The Common Brown Tree Snake (*Dipsadomorphus trigonatus*)—21. 11 from Nagar and 10 from the District. A fairly common snake (total number 55). One good fresh live specimen was secured from the well in my compound on 17th November 1932 where it was seen swimming. It was brought up entangled on Ber twigs (*Zizyphus jujuba*, Natural order, *Rhamnaceae*). The well has a wall about 3 ft. high and the snake must have fallen in the well from an overhanging Pilu tree (*Salvadora persica*, Natural order, *Salvadoraceae*), where probably it went in search of bird's eggs.

Two were also seen swimming in the well in the Dispensary at Shevgaon, whence they were also brought up alive.

13. The Common Kukri Snake (*Oligodon subgriseus*)—2. 1 from Nagar and 1 from the district.

14. The Banded Kukri Snake (*Simotes arnensis*)—2. 1 from Visapur in the District and 1 from the well in my compound, where it was seen swimming on 17th November 1932 and was brought up similarly to the common Brown Tree Snake mentioned in 11 above and on the same date.

15. The Three-striped Coral Snake (*Callophis trimaculatus*)— 2. From the district—1 from Newasa and 1 from Visapur.

16. The Common Krait (*Bungarus caeruleus*)—9. 2 from Vispaur in the District and 2 were from my bungalow compound; 1 from the compound of the Indian Military Hospital. One was found at 3 a.m. in the engine room of the City Electric Supply Co. One 9 in. long was found on 17th July 1932. The hatching period of this snake here seems to be the months of June and July.

In my last note I had mentioned that no kraits were found on the south side of Bhingar Nullah, but in this lot, 4 were found on the south side and 3 on the north of the nullah, showing that its distribution is not limited to either side.

17. The Cobra (*Naia tripudians*)—27. 15 from near Nagar and 12 from the District. 1 wheaten-coloured from Kharda. The others were dark coloured. All were binocellate. The longest was 62 in., the other big ones being 56 in., 48 in. and 43 in.

18. The Russell's Viper (*Vipera russelli*)—4. All from the District. 3 from Newasa and 1 from Toka, six miles from Newasa, where the River Pravara joins the Godavari River.

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19. The Phoorsa (*Echis carinata*)—8. All these were found in one place only in the District, at Newasa, which is on the River Pravara. They were all found in the Dispensary compound which is very near the bank of the river. If anyone wishes to get Phoorsas in this district, this is a place to remember.

These were all the 19 species found and mentioned in my last note. Four other species were also found in this new collection. These are:—

20. *Typhlops porrectus*. A variety of blind snake, not recorded from this District before. It was seen at Jamkhed Dispensary in the District on 19th January 1933.

21. Spot-bellied Polyodont (*Polyodontophis subpunctatus*)—3. 2 from Nagar and 1 from Newasa in the District.

22. Yellow-spotted Wolf Snake (*Lycodon flavomaculatus*). Only 1 specimen was found near Cursetjee's shop in the Ahmedabad Cantonment on 29th November 1932. This is the first one recorded from Nagar though it has been recorded from Poona, Nasik, Dharwar, Sangli, in the Western Ghats.

23. *Coronella brachyura*. One specimen of this from Visapur in the District was seen on 1st December 1932. This is considered a rare species as only three specimens were recorded until recently (from Poona and Berar). Dr. Lindberg from Kurduwadi, Sholapur District, in his note in the *Bombay Natural History Society Journal* of November 1932 on 'Snakes on the Barsi Light Railway' mentioned that he collected 10 of these. So this species is not so rare as it was made out to be but is fairly common in the Deccan and probably in the adjoining parts of Berar. But being a small thin snake few persons kill it or preserve it. The specimen I got in Visapur is in the British Museum now.

POONA.

June 23, 1934.

K. G. GHARPUREY,

Lt.-Col., I.M.S.,

Offg. Surgeon-General with the Govt. of Bombay.

XXX.—MATING OF THE HAMADRYAD OR KING COBRA (*NAIA BUNGARUS* SCHLEG.).

On the 28th instant at 5-30 p.m., after returning from a walk I was ascending the hill leading to my bungalow, which is 80 ft. above the alluvium flats, a coolie drew my attention to what I would describe as a bundle of snakes, all entangled, coming down the hill towards me. On making closer investigation, I found it was two Hamadryads mating. I immediately sent for my gun and the first shot hit the smaller one of the two, which at once fastened its fangs on to the larger one. The second shot hit the big one in the centre of the back and it in turn seized the smaller one by the head. The third shot into the hood finished him off.

Both snakes were jet black in colour, with bluish markings underneath. The inner side of the hoods were yellow with a tinge

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of red around the edges. The measurements of the bigger one were as follows:—

Length.	12 feet 10 inches.
Circumference.	10 inches.
Width of head.	3½ do.
Width of hood.	1 foot 2 inches.

I might mention that when the hood was measured, it was not unduly stretched.

I only measured the length of the small one which was 8 ft. I have had the heads of the snakes cut off and placed in a covered basket in a stream and when the flesh has fallen away, I shall forward the skulls for your inspection.

As old Karen and Burman jungle folks have informed me that they have never come across a Hamadryad the length and size of the larger one I shot, it would be interesting to know if this is anything like a record.

PALAW. W. J. L. SMITH,
Via MERGUI. *Manager.*
January 31, 1935. *Malayan and General Trust* (1933), *Ltd.*

[The largest known Hamadryad, the skin of which is in the collection of the Society, measured 15 ft. 5 in. Col. Wall records two specimens of over 14 ft. There is a reference to an 18 ft. specimen in Ditmar's *Snakes of the World*.—EDS.]

XXXI.—OCCURRENCE OF *DIPSADOMORPHUS MULTIMACULATA* SCHLEG. IN ASSAM.

An example of this snake was sent to the Society for identification by Major C. S. P. Hamilton, Chief Medical Officer, Juri Valley Medical Association, Juri, South Sylhet, Assam. Boulenger, *Fauna of British India*, 'Reptiles', p. 361, limits the distribution of this species to Burma, Southern China, Siam, Malay Peninsula and Archipelago.

BOMBAY NAT. HIST. SOCIETY. S. H. PRATER,
February 15, 1934. C.M.Z.S.

XXXII.—THE COMMON CHAMAELEON (*CHAMAELEON ZEYLANICUS* LAURENTI) IN GUJARAT.

I noticed a note in Vol. xxxvi. No. 2 by Mr. Acharya on the unfrequent occurrence of *Chamaeleon calcaratus*[1] in Gujarat. It might interest readers to know that in July 1933 our servants caught a very fine and large specimen in a Nim tree beside the bungalow in our compound in Borsad. He was very friendly and

[1] [*Chamaeleon calcaratus* Boulenger is now considered a synonym of *C. zeylanicus* Laurenti.—Eds.]

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we even managed to get a photograph of him which however would not bear reprinting owing to the dullness of the monsoon day.

Again in September 1934 a young one was caught at the College. He was full of fun and walked all over me without showing any anger or fear except when he noticed the tiny coloured flowers on my frock, when he puffed himself out and spat and tried to snap at what he must have thought were wonderful insects which would make a delicious meal!

These are the only two I have seen in nine years in Gujarat.

MARY BROWN MEMORIAL TRAINING COLLEGE,
BORSAD. AGNES T. BARRY,
February 7, 1935. *Principal.*

XXXIII.—RATE OF GROWTH OF THE MUGGER [*CROCODILUS PALUSTRIS* (LESSON)].

On the 1st June 1915, I secured a baby mugger 11 in. long, which had recently left the egg. I kept it in the vivarium of the Museum where it lived for over 19 years, growing yearly at the rate of 2 to 9 in. or a rough average of 4 in. yearly. As it had attained to over a length of 7 ft. and as no suitable accommodation could be secured for it locally I have presented it to the Victoria Gardens, Bombay.

CENTRAL MUSEUM, NAGPUR. E. A. D'ABREU,
November 15, 1934. F.Z.S.

XXXIV.—BUTTERFLIES OF LAHORE.

I have read Brigadier W. H. Evans's comment on my reply to his original note on my paper on the 'Butterflies of Lahore' (*Bulletin of the Department of Zoology*, Panjab University, vol. i, pp. 1-61, pl. i-iv, April 1931) published in the *Journal of the Bombay Natural History Society*, vol. xxxv, No. 4, dated 15th July 1932. I would once more emphasize the fact that only one specimen each of the four species under discussion was collected by me from Lahore. It is not certain whether those species occur in a wild state in Lahore or the specimens I collected had been imported from elsewhere.

According to Brigadier Evans 'Mr. Antram's record of *Melitaea didyma* from the Punjab is certainly incorrect'. I may point out that the above species has been recorded from the Punjab by Bingham also (*Fauna of British India*, 'Butterflies', vol. i, 1905, p. 454).

Brigadier Evans's remark that the species which Mr. Rhe-Philipe missed from Lahore and which were subsequently collected by me 'have doubtless existed there for centuries' seems to imply that the butterfly fauna of a locality does not undergo any change.

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Such an assumption would not be in accordance with observed facts.

GOVERNMENT COLLEGE,
LAHORE. D. R. PURI.
December 5, 1932.

[Mr. Puri states that only one specimen each of the four species under discussion was 'collected' by him in Lahore. In the next sentence he states that he is not certain whether these species occur in the wild state in Lahore or whether they had been imported from elsewhere. His 'collecting' may therefore suggest that the specimens in question might have been given him by someone who may have 'said' that he had got them in Lahore. It seems difficult otherwise to explain Mr. Puri's statement that 'it is not certain whether those species occur in wild state' in Lahore.

As regards *Melitaea didyma*, the Punjab species is actually *trivia* and the distribution of *didyma* does not extend to the plains.

Mr. Puri suggests that the Punjab may slowly change its fauna, but changes of the nature implied by the author of the note do not occur such as the sudden influx of butterflies from thousands of miles away or the descent of high elevation insects to the Indian plains.—EDS.]

XXXV.—MIMICRY: BEING NOTES ON CERTAIN INDIAN BUTTERFLIES.

On page 529 of his classic *Butterfly Hunting in Many Lands*, Dr. Longstaff writes: 'It may not be without interest to record a number of cases in which a collector with defective eyesight has actually been deceived (at any rate momentarily) by mimics in the field'. It is hoped that the following brief notes by a collector, who prides himself on the keenness of his sight, may prove of equal interest.

Papilio polytes, L. ssp. *romulus*, Cr. female and *Byasa hector*, L. female. A good cabinet mimic. I have never seen the two species flying together, in fact the only living *hector* I have seen were males, but their flight seemed more direct and businesslike than that of the mimic. It is of course possible that the females fly in a more hesitating manner.

Papilio polytes, L. ssp. *romulus*, Cr. ♀ f. *stichius*, Hbn. and *Byasa aristolochiae*, F. *aristolochiae*. This form is usually described in books as the '*aristolochiae* form of female'. It is, in my opinion, a poor cabinet mimic and an even less convincing field one. Both its flight and general appearance are unlike the so-called model and I have never been deceived, even momentarily, by it.

Chilasa clytia, L. *clytia* and *Euploea core*, Cr. *core*. *Chilasa clytia*, L. f. *dissimilis*, L. and f. *dissimillima*, Evans and *Danais limniace*, Cr. ssp. *mutina*, Fruhs. These are not over convincing mimics when seen in the cabinet. In flight, however, they are almost perfect, so much so that I have given up recording cases where I have been deceived by single specimens. I once even

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caught two *E. core* and one *C. clytia* with one stroke under the impression that I was catching three of the *Euploea* (vide *Entomologist*, lxvi, p. 119). The slow sailing flight of the mimic, when undisturbed, is an exact imitation of that of the model; if frightened, however, it dashes off with the typical Papilionid flight. When at rest on flowers they are easily distinguished as the mimic keeps up an incessant fluttering whilst the model rests either with the wings motionless or slowly opens and shuts them.

Pareronia valeria, Cr. ssp. *hippia*, F. female and *Danais aglea*, Cr. I have coupled these two species together as there is no other Danaid small enough to act as model, but I have never seen them flying together. They are a fairly good cabinet pair and the Pierid has the typical Danaid flight. Dr. Longstaff records having mistaken the female of *Pareronia ceylonica*, Feld. for this Danaid in Ceylon.

Elymnias hypermnestra, L. ssp. *undularis*, Drury, female and *Danais plexippus*, L. A fair cabinet mimic. It is not, however, very convincing in the field as the flight is very much weaker than that of the model. It also settles frequently and shews the non-Danaine underside.

Elymnias malelas, Hew. *malelas* male and *Euploea* sp. The only specimen I have seen alive was caught whilst touring near Darjeeling under the impression that it was one of the blue Euploeas.

Hestina nama, Dbl. and *Danais tytia*, Gray, *tytia*. A good cabinet pair. I have never seen the Danaid alive but I was completely deceived by the mimic when first I met it and was surprised to find that I had caught a Nymphalid and not a Danaid.

Hypolimnas misippus, L. female and *Danais chrysippus*, L. An almost perfect cabinet mimic and equally good in the field. I have a specimen which was caught after being watched some time, both flying and at rest, and which was only recognised as a Nymphalid when it was being papered.

Argynnis hyperbius, L. *hyperbius* female and *Danais chrysippus*, L. A poor cabinet mimic of either *D. chrysippus*, L. or *D. plexippus*, L. On the wing it resembles a brown *Danais* but the resemblance is not definite enough for it to be mistaken for any given species.

LONDON. D. G. SEVASTOPULO.
August 21, 1933. F.R.E.S.

XXXVI.—A PRELIMINARY LIST OF THE *PYRALIDAE* OF CALCUTTA.

Most local lists are concerned with the Rhopalocera, so a list of one of the more neglected families of the Heterocera may be of interest. The *Pyralidae* listed below have all been caught at light in the heart of Calcutta during the last three years. Hampson, whom I have followed as regards nomenclature, names 1,136 species of *Pyralidae* in the fourth volume of Moths in the *Fauna of British*

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India, published in 1896. My list consists of 91 species and I still have a fair number awaiting identification.

Galleria mellonella, L.
Ancylolomia chrysographella, Koll.
Ramila marginella, Moore.
Scirpophaga auriflua, Zell.
Schoenobius immeritalis, Wlk.
,, *bipunctifer*, Wlk.
,, *adjurellus*, Wlk.
,, *incertellus*, Wlk.
Cirrhochrista brizoalis, Wlk.
Euzophera perticella, Rag.
Nephopteryx pauroscma, Meyr.
,, *leucophaella*, Zell.
Phycita hemixanthella, Hmpsn.
Hypsopygia mauritialis, Boisd.
Pyralis pictalis, Curt.
,, *manihotalis*, Guen.
Tamraca torridalis, Led.
Herculia nigrivitta, Wlk.
,, *igniflualis*, Wlk.
,, *suffusalis*, Wlk.
Nymphula crisonalis, Wlk.
,, *fluctuosalis*, Zell.
,, *depunctalis*, Guen.
Oligostigma bilineale, Snell.
Talanga sexpunctalis, Moore.
Hymenoptychis sordida, Zell.
Tatobotys varanesalis, Wlk.
Bradina admixtalis, Wlk.
Hydrorybina bicolor, Moore.
Pycnarmon virgatalis, Moore.
,, *caberalis*, Guen.
,, *meritalis*, Wlk.
Zinckenia fascialis, Cram.
Eurrhyparodes tricoloralis, Zell.
,, *bracteolalis*, Zell.
Agrotera basinotata, Hmpsn.
Pagyda traducalis, Zell.
Ercta elutalis, Wlk.
,, *ornatalis*, Dup.
Cnaphalocrocis medinalis, Guen.
Marasmia venilialis, Wlk.
,, *trebiusalis*, Wlk.
,, *trapezalis*, Guen.
Syngamia floridalis, Zell.
Bocchoris acamasalis, Wlk.
Dichocrocis evaxalis, Wlk.
Ceratarcha umbrosa, Swinh.
Botyodes asialis, Guen.
,, *flavibasalis*, Moore.
Sylepta aurantiacalis, Fisch.
,, *lunalis*, Guen.
,, *derogata*, Fab.
Lygropia quaternalis, Zell.
Agathodes ostentalis, Hubn.
Glyphodes laticostalis, Guen.
,, *negatalis*, Wlk.
,, *psittacalis*, Hubn.
,, *hilaralis*, Wlk.
,, *marginata*, Hmpsn.
,, *vertumnalis*, Guen.
,, *unionalis*, Hubn.
,, *stolalis*, Guen.
,, *bivitralis*, Guen.
,, *caesalis*, Wlk.
,, *canthusalis*, Wlk.
,, *pyloalis*, Wlk.
,, *bicolor*, Swains.
,, *indica*, Saund.
Pygospila tyres, Cram.
Euclasta defamatalis, Wlk.
Lepyrodes neptis, Cram.
,, *geometralis*, Guen.
Analyta sigulalis, Guen.
,, *melanopalis*, Guen.
Leucinodes orbonalis, Guen.
,, *apicalis*, Hmpsn.
Crocidolomia binotalis, Zell.
Sameodes cancellalis, Zell.
Archernis tropicalis, Wlk.
Terastia meticulosalis, Guen.
Isocentris filalis, Guen.
Maruca testulalis, Geyer.
Tetridia caletoralis, Wlk.
Pachynoa sabelialis, Guen.
Pachyzancla licarsisalis, Wlk.
Antigastra catalaunalis, Dup.
Noorda blitealis, Wlk.
,, *fessalis*, Swinh.
Pionea albicostalis, Swinh.
,, *leucanalis*, Swinh.
Pyrausta incoloralis, Guen.

CALCUTTA.
January 8, 1935.

D. G. SEVASTOPULO,
F.R.E.S.

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XXXVII.—A NOTE ON *ELYMNIAS HYPERMNESTRA UNDULARIS*, DRURY.

The hatching of the larva of *E. hypermnestra undularis* is sufficiently unusual to merit recording.

Lepidopterous larvae, as a general rule, escape from the ovum by eating an untidy hole in the shell, through which they emerge. The subject of this note, however, does not act in this way but instead cuts neatly round the ovum, about three-quarters up from the base, making a hinged cap. This is presumably forced open by the larva and then falls back into place. The larva rests beside the apparently intact eggshell for a few hours and then eats it as its first meal.

This is the only species of Satyrid that I have bred from ova, so I cannot say if this habit is usual in the family. If it is, I have never seen it recorded. No other Lepidopteron that I have bred has treated the egg in this way.

Since writing my note on the hatching of the larva of this species, I have received a specimen page, describing the life-history of *Satyrus* (*Melanargia*) *galathea*, L., from *The Complete Book of British Butterflies* by F. W. Frohawk.

In this Mr. Frohawk writes: 'Upon hatching, the young larva eats round the crown of the egg, cutting out a large circular lid, and pushes it off upon emerging'. This habit may, therefore, be more or less general among the Satyridae.

CALCUTTA. D. G. SEVASTOPULO,
January 8, 1935. F.R.E.S.

XXXVIII.—WAX-PRODUCTION IN MEALY BUGS: *ALEURODIDAE*.[1]

The secretion of wax is a very commonplace phenomenon in many of the *Homoptera* and is particularly noticeable in all the families of *Sternorhyncha*. Wax is secreted by special structures known as *wax-glands*, *wax-cells* and *wax-pores*. The arrangement, position and structure of these may differ in different families. The secretion of wax is found in the larval as well as in the adult stages. In the family *Aleurodidae*, wax-secretion is profuse in the adults of all the species, but not found to the same extent in the larvae. Generally three types of wax-pores are found in the larvae of *Aleurodidae*: (1) simple, (2) agglomerate and (3) compound. The structure of the simple and compound wax-pores is as follows:—

Simple wax-pores are circular holes of small or large size in diameter from .017 mm. to .027 mm. These exist in greater numbers in those species which secrete a large quantity of wax. In

[1] These observations were made on *Trialeurodes vaporariorum*—the greenhouse white fly—at Edinburgh, under Dr. C. B. Williams, now the Chief Entomologist, Rothamsted, England.

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compound pores the holes have a chitinous ring surrounding them and a definite elevated cup-like structure. Within the cup the pores are arranged in a ring and are produced into more or less elevated rods or tubes.

In the adults there are chitinous plates which are placed ventrally on the abdominal segments and are known as wax-plates. These may be comparable to the wax-plates in honey bees. There are two pairs of these plates in the female placed on the third and fourth segments respectively, and four pairs in the male on the third, fourth, fifth and sixth segments. These wax-plates appear like thick pads and are oily yellow in appearance. They are separated by a median line in the centre of the abdomen but extend considerably outwards on both sides so that they can be very clearly seen laterally as they are bounded by a black line.

In the female both the plates appear to be equal in dimensions, but in the male the first one is bigger and the succeeding ones gradually reduced in size. When viewed under microscope these present an appearance of plates possessing minute holes arranged in regular rows.

When highly magnified (1,200 times under the oil-immersion lens) these holes appear like cells in a honeycomb. These are the minute circular pores through which wax comes out or is forced out in small minute particles or threads. In thin microtome sections taken through these wax-glands there is seen a single layer of secreting cells with large nuclei which contain vacuoles. There are numerous granules in these vacuoles which are found in a large number towards the outer side.

A careful examination of these plates in a male of *T. vaporariorum*, under a very high magnification, shows that each of the last three plates contains 40 rows of 90 cells each at an average; the first one has 50 rows as it is larger. Thus the total number of pores of one side comes to 3,600 × 3 = 10,800 plus 50 × 90 = 4,500 = 15,300 or approximately 15,500 and both the sides together will bring the number to 31,000. Each side on the abdomen the space occupied (longitudinally) is .3 mm. In the female there are only two pairs of plates which are rather broader and occupy space to the extent of .23 mm. each side. Each of the plates contains pores in rows of 63 × 95 and 60 × 95 cells respectively. The total number of pores on one side thus comes to 11,685 or nearly 12,000. It is not understood why the number of pores is less in females.

Freshly hatched specimens are perfectly free from any wax particles soon after emergence. The wax-plates, not being at work, cannot be marked out very clearly.

I give below my observation on a specimen for about 5 hours from its emergence. It was a male. It extricated itself with great difficulty from the pupal case which operation took it about an hour. This was at 10 a.m. In the first two hours no wax was seen being secreted but only the wax-plates assumed an oily olive appearance.

Then one of the plates (on the left side) was seen covered with white flocculent material which soon after drying became white.

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The insect (which was under a binocular) was actively moving its legs first of one side and then of the other. In this way the legs actually brushed off the wax accumulated on the plate and by dashing the legs here and there it distributed the wax or the meal all over its body.

As the plates on the left side were active, the left side of the body was covered with wax, first the abdomen and its end, then the underside of the wings and then the front part of the body. Gradually all the plates began to secrete wax which was being spread all over the body. All the plates were in full action by 3 p.m. i.e. 5 hours after emergence.

The structure of the meal or the wax secreted is very peculiar. It is in the form of spiral threads as if forced out through small holes, but under abnormal conditions, or if the meal is not constantly removed by the brushes on the legs, it assumes the form of long threads appearing like silken combs or tufts. While observing the eclosion of flies from the pupae, I have seen several specimens with three-fourths of their body out and struggling hard to extricate the last part of the body. The insect stands erect and dashes its legs in the air; with wings in the unexpanded condition. The wax-plates are active and the wax begins to appear on the body. As no brushing off is possible in that condition, the wax goes on accumulating and a very thick brush-like layer is formed.

Under the microscope these appear like bunches of long threads with one end curved. I have also observed cases of partial emergence wherein the flies have died after the upper part of the body —head and thorax—having come out, the abdomen remaining inside the pupal case. In such cases I have found after pulling out the abdomen that it was full of waxy brushes, proving thereby that the wax-plates were actively secreting wax even though the abdomen was enclosed in the pupal covering.

DEPARTMENT OF AGRICULTURE,
BOMBAY.
January 8, 1935.

V. G. DESHPANDE,
M.Ag. (Bom.), PH.D. (Edin.).

XXXIX.—AN ANNOTATED LIST OF INDO-CEYLONESE TERMITES.

Since the publication of the Catalogue of Indo-Ceylonese Termites (vol. xxvii, No. 3) the writer has come across a paper on 'New Termites from India' by Thomas E. Snyder (*Proceedings of the United States National Museum*, vol. 82, Art. 16, pp. 1-15, pl. 1, 1933). The paper deals with the following species:—

Fam. *Kalotermitidae*:

Kalotermes (*Neotermes*) *andamanensis*, Snyder. A new species, from North Andaman Island. 'Close to *Kalotermes* (*N*) *greeni*, Desneaux of Ceylon.'

Kalotermes (*Neotermes*) *bosci*, Snyder. From Mathranwala, Dehra Dun, United Provinces, India. 'ex. *Ficus* sp.'

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	Kalotermes (*Neotermes*) *gardneri*, Snyder. From Dehra Dun. 'ex. rotten *Mangifera indica*.'
Fam. *Rhinotermitidae*:	*Heterotermes malabaricus*, Snyder. From 'South Mangalore, 400 ft. Malabar Coast.'
Fam. *Termitidae*:	*Termes* (*Termes*) *dehraduni*, Snyder. Also from Dehra Dun.
	Termes (*Termes*) *malabaricus*, Holmgren. Also from Dehra Dun.
	Termes (*Cyclotermes*) *almorensis*, Snyder. 'West Almora Forest Division, United Provinces, India. Altitude 5,000 ft.'
	Microtermes pubescens, Snyder. From 'Dehra Dun, United Provinces, attacking aerial roots of *Ficus bengalensis*.'
	Nasutitermes (*Nasutitermes*) *fletcheri*, Holmgren. Recorded from 'Anamalai Hills, 2,400 ft., Madras.'
	Nasutitermes (*Rotunditermes*) *anamalaiensis*, Snyder. 'Anamalai Hills, 2,400 ft., Madras.'
	Nasutitermes (*Subulitermes*) *gardneri*, Snyder. 'Rangirum, Darjeeling, Bengal, India, in rotted wood at an elevation of 6,000 ft.'
	Microtermes beesoni, Snyder. 'Chakata Range, Haldwani, United Provinces, India.'
	Microtermes championi, Snyder. 'Haldwani District, Kumaon, United Provinces, India.'

All the above ones, except *Nasutitermes* (*Nasutitermes*) *fletcheri*, Holmgren and *Termes* (*Termes*) *malabaricus*, Holmgren, are new species described by Snyder.

AGRICULTURAL RESEARCH INSTITUTE,
LAWLEY ROAD, COIMBATORE. V. MARGABANDHU.
November 27, 1934.

XL.—A NOTE ON THE DISTRIBUTION, OVIPOSITION AND PARENTAL CARE OF *SCUTIGERELLA UNGUICULATA* HANSEN VAR. *INDICA* GRAVELY.

(*With two text-figures*).

Soon after the first few monsoon rains in 1932 I collected from Kovalam[1] a number of specimens of *Scutigerella unguiculata* Hansen var. *indica*, which Gravely recorded from Calcutta (4)[2].

[1] Seven miles to the south of Trivandrum near the coast.
[2] The number in brackets denotes the literature referred to.

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Later on when collecting cryptozoic forms from various places near Trivandrum and also from Ponmudi hills (3,500 ft. above sea-level in the Western Ghats), I found that it occurred fairly abundantly in all wet situations under stones, and under rotting leaves and timber.

As this variety recorded from Calcutta occurs in the southern extremity of India it is probable that it may be distributed in the intermediate regions also. Gravely in a footnote (4) says that he had found this form in Kandy and Pattipola in Ceylon and adds that Green had told him about a similar looking centipede that he had seen at the top of Namunukuli hill and says that it is probable that it is widely distributed throughout the Island. Last March I myself collected this variety from Kandy and from various parts of the Uva Province including Passara (3,000 ft.) at the foot of the Namunukuli hill, and am in a position to confirm the opinion of Gravely regarding its wide distribution in the Island of Ceylon.

The species *subunguiculata* Imms is recorded from Danaulti in Tehri Garhwal. It is the only species of *Scutigerella* recorded from India (3). *Scutigerella unguiculata* Hansen is from La Moka, Venezuela (2).

Habits.—These active little creatures avoid light. The specimens are not found during summer but suddenly make their appearance in large numbers as the rainy season commences. A specimen that I kept in a small tube three months ago with a small quantity of moist earth is still living.[1] The only food it had since then is the blue green alga formed inside the tube. I have reared a number of specimens and have never found them to be predaceous.

Oviposition.—The animal lays five to nine eggs at a time. I have seen the captive animal laying the eggs in groups of two or three in a careless manner whereas in natural conditions they are laid in a single cluster. The eggs are held together though not very firmly.

Each egg is imperfectly oval with a number of projections resembling a morous fruit (fig. 1). These projections are formed by the silken network that the animal spins on the surface with the aid of its cerci. Wherever the silken threads reticulate a projection is found. Figure 2 shows the photomicrograph of an egg-mass mounted in balsam. The silken network has dissolved and the eggs have moved apart. It is probable that the secretion from the cerci is of a fatty nature.

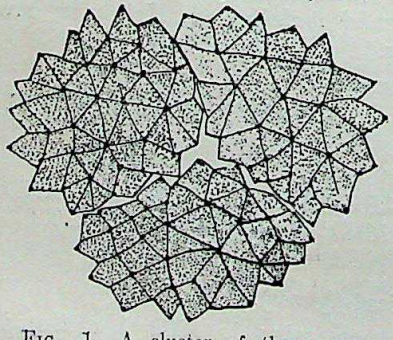


Fig. 1. A cluster of three eggs.

Parental care.—It is particularly interesting to note that this

[1] The animal died a month after this note had been sent.

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minute creature exhibits a sort of parental care that I have observed only among the *Chilopods* in *Myriapoda*. The *Diplopods* always leave the eggs after safely depositing them. The way in which *Scutigerella* incubates the eggs is slightly different from that of the common centipedes *Scolopendra* and *Geophilus*. The *Scutigerella* simply remains over the eggs that are arranged in the manner of a disc probably till hatching time (which I have not seen). In the case of *Scolopendra* the mother bends once round the eggs and embryos and holds them together by the aid of its legs; and in the case of *Geophilus* the mother coils its long body round the eggs a number of times with the anterior end alone free.

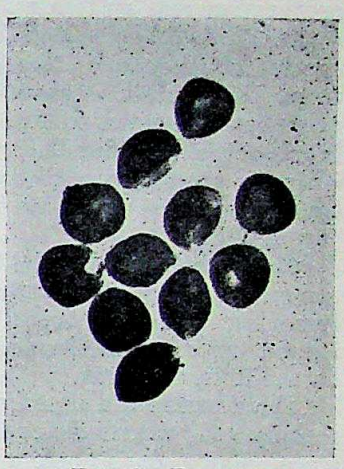


FIG. 2. Egg-mass.

Recently when a stone was turned over I saw a specimen of *Scutigerella* incubating its eggs. The creature instead of running away calmly remained near the eggs and began to eat them. This work took about five minutes, after which it began to move about actively. On examination I found that the contents of four eggs had been completely sucked, the shells alone of which remained, while the fifth one remained untouched. *Scolopendra* also behaves in a similar way but only in captivity.

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DEPARTMENT OF ZOOLOGY,
COLLEGE OF SCIENCE, S. JONES, B.A.
TRIVANDRUM.
September 20, 1934.

XLI.—OBSERVATIONS ON THE OVIPOSITION AND DEVELOPMENTAL STAGES OF A SPECIES OF *POLYXENUS*.

(*With* 2 *plates*).

Since July 1933 I have been engaged in working out the anatomy and development of this Diplopod which occurs fairly abundantly in Kovalam, 7 miles to the south of Trivandrum. A

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detailed account of the anatomy and development is in course of preparation and will be published later.

This Pselaphognathous Diplopod (provisionally determined as a species of *Polyxenus*) is seen under stones and under the barks of trees. The adult measures from 3.5 to 4 mm. There are transverse rows of setae on the head and tergites (fig. 1). The pleurae bear setae in bundles. The sternite of the last segment which is apodal bears a thick median bundle of long setae specially constructed to serve as an organ of defence for the animal (fig. 2).

The antennae are eight-jointed, and the two laterally placed eye-groups are each composed of 8 ocelli. There are 11 trunk segments with 13 pairs of legs. Genital openings are situated behind the coxae of the second pair of legs and the anus is situated on the 10th segment.

The females are usually slightly larger than the males and especially so when distended with ripe ova. Copulation takes place many days before oviposition. In the vas deferens the spermatozoa are short and kidney-shaped and appear to be provided with a membranous covering. After the transference of the spermatozoa into the receptacula seminales of the female the membranous covering disappears and the spermatozoa grow in length.

Eggs are laid at night. The mother envelopes the egg-mass with a large number of setae from its postanal median bundle which it voluntarily dislodges for the purpose (fig. 3). This setal envelope efficiently helps to scare away the egg-eating enemies which in this case is a microscopic mite belonging to the family *Tyroglyphidae* and a Neuropteran insect belonging to the family *Psoscidae* commonly known as a book-louse.

Usually 20 to 40 eggs are laid in the form of a plate one layer thick. The eggs are oval or kidney-shaped and measure 0.32 mm. long and 0.18 mm. broad and are arranged vertically with their broader side up.

About nine days after the eggs are laid the eggshell ruptures in the middle transversely and there wriggles out from it the pupa which remains quiescent for seven days.

The pupa is encased in a thin membrane formed by a secretion of the embryonic ectodermal cells. The surface of the pupa is tuberculated. Rudiments of antennae, limbs and pleural projections are seen as small buds.

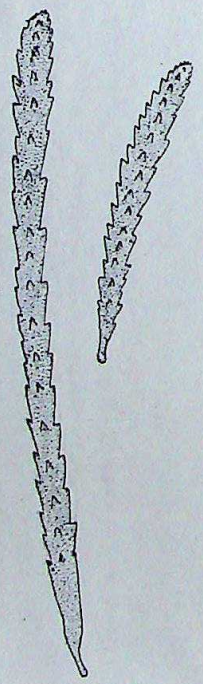
(It may be stated here that the presence of a pupal stage in the life-history of *Pselaphognatha* has not been recorded by any of the previous workers on this group.)

On the fourth day 5 simple ocelli develop on each side of the pupa. The pupa which is at first pure white in colour acquires a brownish tinge.

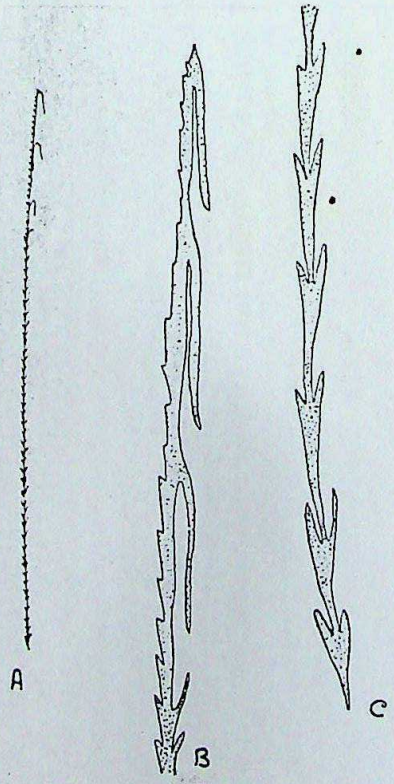
On the seventh day the pupal membrane ruptures in the region of the head and a tiny white larva bearing 3 pairs of legs comes out and actively moves about and feeds.

The stages of the larval development are shown in the tabulated form. The interval from moult to moult is very variable. It

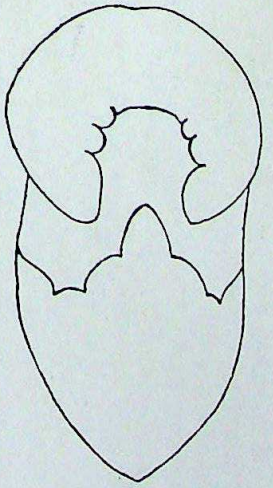
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1



2

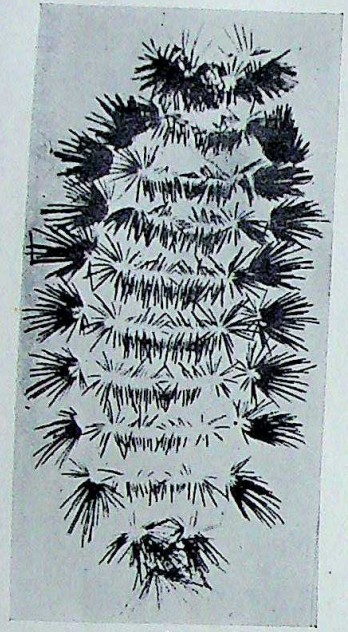


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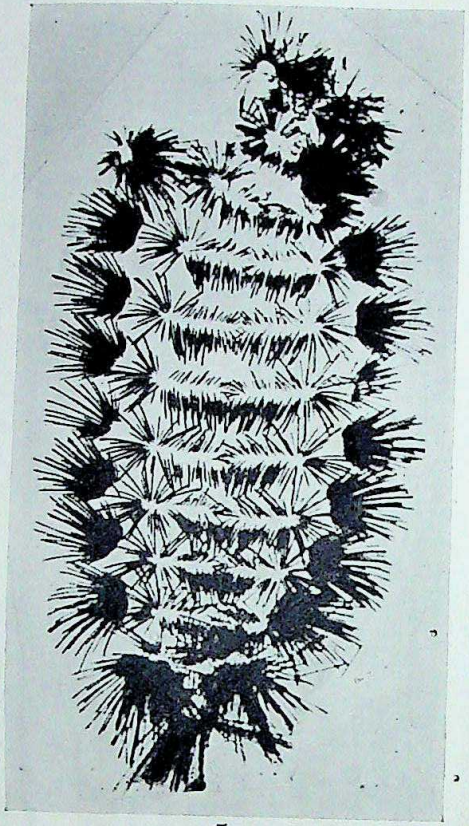
1. Ordinary setae. 2. Defensive setae.
3. Pupa, front view (mag. ×170).

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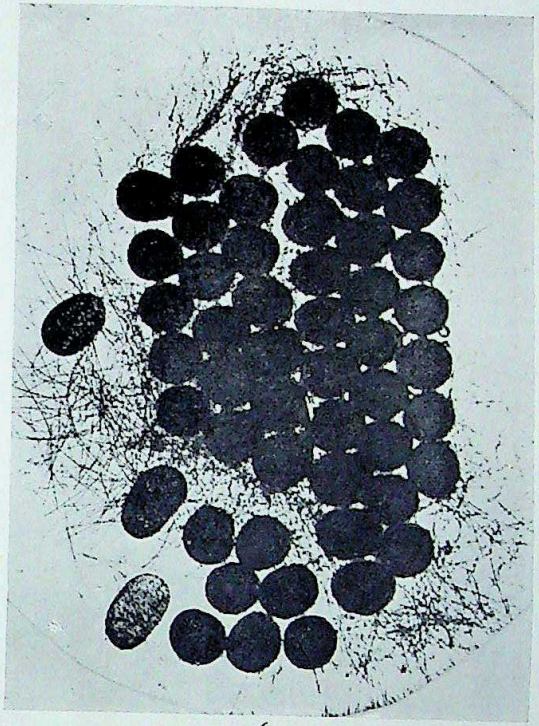
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4



5



6

4. Moult of male. 5. Moult of female. 6. Egg mass with the setae all round.

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depends on the quality of food supplied and other conditions of rearing. In the later stages there is a progressive increase in the intervals between the succeeding moults.

Stage.	No. of Tergites.	No. of paired legs.	Presence of ext. reproductive openings.	Time taken for next moult.
I ...	5	3		14 days.
II ...	5	4		16 ,,
III ...	6	5		3 weeks.
IV ...	7	6		3 to 4 weeks.
V ...	8	8		4 to 7 ,,
VI ...	9	10	♂ ♀	7 to 10 ,,
VII ...	10	12	♂ ♀	7 to 10 ,,
VIII ...	11	13	♂ ♀	8 to 10 ,,

The animal continues to moult even after acquiring the full complement of segments and appendages. The details of the developmental stages of *Polyxenus* represented in the tabular statement above agree fairly closely with those of female *Polyxenus lagurus* as investigated by Reinecke.

The female becomes sexually mature only long after acquiring the full number of legs and appendages whereas the male becomes sexually mature even when it possesses only 10 segments and 12 pairs of legs. During moulting the old setae are all shed along with the exoskeleton and the new setae that replace them are pure shining white in colour turning grey on the second day.

The figures 5 and 6 show the moults of a male, female at the VIII stage. Photomicrographed.

Department of Zoology,
College of Science, S. JONES, B.A.
Trivandrum.
August 20, 1934.

XLII.—PRECOCIOUS GERMINATION.

In the 'Science Notes' of the September issue of *Current Science*[1] there is a reference to a case of abnormal development of the radicle in a perfectly ripe fruit of Mango, reported by Mr. Tara Chand Nandi. In this connection it is stated also that the probable explanation is sought by the writer to be unfavourable condition of the soil.

In the absence of the complete text, it is not clear whether germination had started on the plant, or the germinating fruit was

[1] *Current Science*, 1934, iii, 3, 128.

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obtained from the market. If the former, this will be perhaps the first case of its kind seen. If the latter, it should be noted that this is not at all a rare phenomenon. Such mango seeds, germinating inside the mother fruit, have been frequently observed by me, particularly from specimens obtained late in the season, or even long after the fruiting normally ends. In this connection, however, one fails to see the significance of the remark that the development of the radicle was due to unfavourable conditions of the soil. Where does the soil come in at all—much less its unfavourable effect—in these cases, is not at all clear. These are points on which one would like to have more light thrown. On the other hand, as will be shown later, such cases of precocious germination are indeed due to the particularly favourable environment of the seed. Another point that may be mentiond in connection with germination of this type is that the otherwise soft pulp becomes hard and 'knotted' in the vicinity of the germinating radicle.

If the fruit showing the peculiarity was purchased from the market, it is to be noted that the fibreless varieties of mango, to which the *Fazli* belongs, are always artificially ripened in a packing of hay or some similar stuff. The nature of the packing material varies according to the time when the fruits are required for consumption.

Furthermore, such cases of precocious germination are not rare even otherwise. They have been seen and reported in other fleshy fruits, which specially seem to favour such germination. *Papaya* is one such. In this fruit germinating seeds have been observed not only by me, but also reported by others.[1, 3] Other fleshy fruits characterised by the same feature are: *Cacti*, *Melocanna bambusoides*,[2] *Cucurbita*, apples, tomatoes, etc.,[3] *Dracaena*, Mandarin orange, *Mermecodia*.[1]

With reference to the author's statement that such a form of germination is known in the case of viviparous mode of life, it is merely begging the question. 'Viviparous mode of life' is a somewhat vague and loose statement, not always connoting the same idea. It has been used in a wider sense to mean, for example, the uninterrupted development of the embryo, without a resting period (or a seed stage), whether or not within the fruit itself; as also in a more restricted sense, of germination in the fruit on the plant. (Mattfeld, as cited by Engler,[3] excludes under this designation the germination of the seeds altogether, including these under 'Bioteknose', and restricts it to cases of sprouting of detached shoots, buds and bulbils, in the position of flowers, endowed with the capacity of living and developing independently.) The latter, however, is the more generally accepted view.

If used in the latter sense, it should mean that the fruit with the germinating seed was obtained directly from the plant, which is not clear. If the former, then there are already a number of plants in which uninterrupted development of the germ

[1] Guppy, 1906. *Observations of a Naturalist in the Pacific*, ii. London.
[2] Goebel, 1923. *Organographie der Pflanzen*, iii. Jena.
[3] Engler, 1926. *Pflanzenfam.* xiv a. Leipzig.

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from the fertilised egg to the complete seedling, has been reported. Some examples of fleshy fruits have already been mentioned above. But there are also *dry* fruits in which similar relation is found. Such are, for example, *Crinum* and *Cryptocoryne*,[1] among others, where there is an uninterrupted development of the germ even under ordinary conditions. Others whose seeds do not ordinarily germinate but do so when the temperature and humidity of the surroundings are high are: *Dryobalanops camphora*, wheat grains on the stalk,[1] *Ipomea glaberrima*, *I. peltata*, *Hibiscus diversifolius*, *Croton sp.*, *Luffa cylindrica*,[2] *Juncus*, *Epilobium*, *Agrostemma*, *Papaver somniferum*, *Tetranema mexicana*,[3] *Avena* sativa.[4] Mr. Joshi[5] also mentions *Atriplex* and *Suaeda*, but these were collected in wet weather in December.

Really speaking, vivipary is found to be, on analysis, the final expression of a continuous chain of events, beginning with the detachment of immature seed with a rudimentary embryo, and, therefore, requiring an obligatory period of rest for ripening in the soil, and ending with those seedlings which remain growing for months on the tree e.g. *Rhizophora*, *Brugiera*, etc. The intermediate links are represented by (1) those seeds which are quite mature when detached from the parent and hence ready to germinate as soon as fallen on the ground; (2) seeds which merely begin to germinate while still on the plant, but soon get detached and fall off e.g. *Laguncularia* and (3) mangrove plants where germination is completed on the tree, but the seedling is forthwith liberated, e.g., *Avicennia*. It is, in fact, a matter of small beginnings, or as Guppy[2] conceives and puts it 'a matter of small endings'. According to him it represents an adaptation to primitive condition, when in remote geological times, there was a uniform climate over the whole of the earth (an inference not wholly accepted[6]), and the resting period of the seeds is due to the differentiation of the climate and the ushering in of distinct seasons. Joshi,[7] however, demurs to his explanation and has suggested that the viviparous habit probably arose as a deviation from the normal, and that it is a device to dodge the injurious action of the saline habitat in preventing the germination of the seed in the soil. According to him the viviparous plants have become grouped together near the sea-shore, because the habit really proved useful there, characterised as it is by a constantly high salinity throughout the year.

The obligatory resting period may be due to a variety of causes. As already indicated, the seed may be detached when the embryo

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[1] Goebel, 1889. *Pflanzenbiol. Schild*, i, 117-134. Marburg.
[2] Guppy, 1906. *Observations of a Naturalist in the Pacific*, ii. London.
[3] Engler, 1926. *Pflanzenfam.* xiv a. Leipzig.
[4] Weaver and Clements, 1929. *Plant Ecology*. New York and London.
[5] Joshi, 1932. *Journ. Ind. Bot. Soc.*, xi.
[6] Seward, 1931. *Plant Life through the Ages*. Cambridge.
[7] Joshi, 1933. *Journ. Ecol.*, xxi, 1.

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is still immature. In other cases the resting period may be necessary in order to complete chemical changes, known as after-ripening, which are necessary before germination can start. In still other cases (examples already cited) it may be merely facultative and determined by the physical conditions of the environment. A particularly striking example of this was reported by me[1] in the case of gram, where the sappy green seeds, under certain circumstances, may continue their uninterrupted development, although ordinarily the seeds of this plant undergo a period of rest.

On an examination of the cases of precocious germination of seeds, otherwise requiring a resting period, one fact which clearly emerges, is that great humidity combined with a high temperature are predominantly associated with the phenomenon in question.[2] From this the germination of the mango seed inside the pulpy fruit is quite intelligible. The conditions under which ripening mangoes are stored, buried in a mass of hay or some similar stuff, in the steamy atmosphere of the rainy season and further enhanced by the ripening juicy pulp of the fruit itself, are most ideal for favouring and maintaining uninterrupted development of the embryo. Therefore, in these conditions it is not surprising that what appears by comparison to be precocious germination, should result. In fact, as Goebel[3] has pointed out, the absence of a resting period in inhabitants of moist localities is bound up with the fact that from their ripening seeds not so much water is withdrawn as under conditions obtaining elsewhere.[3] Analogous conditions exist with regard to the mango seed, and the same explanation would appear to apply to the case in question.

BENARES HINDU UNIVERSITY. N. K. TIWARY.

February 1935.

XLIII.—ROOT FORMATION FROM LEAF-CUTTINGS.

On pages 105-106, vol. iii, No. 3, of *Current Science* Mr. P. E. Mullik[4] records interesting observations on the development of roots from the petiole of *Ficus religiosa* leaf, noted incidentally during an investigation of an altogether different kind. In his note the author gives a brief account of the process of root-formation from the petiole of the leaves kept in tap-water as well as in Pfeffer's dilute nutrient solution. He, however, adds that when

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[1] Tiwary, 1932. *Beihefte zum Bot. Centralbl.*, xlix, 1. Dresden—N.

[2] This precocious germination is also seen in the spores of the *Bryophyta*, e.g., *Pellia*, *Androcryphia*, *Fegatella*, *Dendroceros*, all inhabitants of moist localities, the spores germinating while still inside the *sporogonium* (Goebel, 1915-1918. *Organographie*, ii, 757).

[3] Goebel, 1923. *Organographie der Pflanzen*, ii. Jena.

[4] *Current Science*, 1934, iii, 105-106.

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'one of the leaves with roots was placed in moist sand to see if any shoot would come out' . . . 'it began to show signs of decay' after three days.

Mr. Mullik does not make any mention of the previous literature on the subject, though the development of adventitious roots on leaves, and even the regeneration of an entire plant by the detached leaves are of fairly general occurrence and well known to gardeners who employ them for propagating several species. In this note I propose to deal with observations of a like nature hitherto recorded by various workers.

Identical behaviour on the part of the leaves of *Fittonia verschaffeltii* placed in moist soil was recorded by Krishnamurti.[1] Subsequently Patwardhan[2] and Mullan[3] named other plants in which the phenomenon had been noticed. In later papers Isbell,[4] and Roberts and Lawrence[5] have recorded their own observations on the subject.

Moreover there exists an extensive literature in connection with the phenomenon of regeneration. This has been specially dealt with by Goebel[6] who besides recording his own interesting observations and giving interpretation of the facts, cites also previous literature. More recently, an extensive monograph on the subject of regeneration and transplantation in animals and plants has been published by Korschelt.[7]

Kerner[8] has also discussed the subject in his classical work. This author cites numerous examples of plants regenerating adventitious roots, and even developing buds on severed leaves. The latter have in consequence been extensively employed in horticultural practice. Kenner also records the development of buds on scales and floral leaves. According to him, and other authors, epiphyllous buds, stimulated to develop artificially on severed leaves, are also found naturally on some plants. *Bryophyllum* is the best known example. But many other plants exhibiting the same peculiarity and belonging to several families, in which *Cruciferae*, *Gesneraceae* and *Liliaceae* predominate, are also listed.

More recently Molisch[9] has treated of the topic in some detail. He states that the capacity of leaves to develop roots is very widespread, but that leaves developing both roots and buds are not found in many plants. The leaves of the former category, therefore, cannot be utilised for propagation purposes. A few additional names are mentioned by the author.

The observations of Mr. Mullik are interesting in so much as the phenomenon had not hitherto been recorded for *Ficus religiosa*. One hopes that Mr. Mullik's observations will be successfully concluded and extended further by him and others, as one is really

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[1] *Journ., Ind. Bot. Soc.*, 1930, ix, 65.
[2] *Ibid.*, 1931, x, 165.
[3] *Ibid.*, 1931, x, 167.
[4] *Bot. Gaz.*, 1931, xci, 411.
[5] *Bot. Gaz.*, 1933, xciv, 421.
[6] *Organography of Plants* Engl. Trans., 1900, i, 45ff.
[7] *Regeneration und Transplantation*, 1927, i. Berlin.
[8] *Natural History of Plants* Engl. Trans., ii, 40ff.
[9] *Pflanzenphysiologie als Theorie der Gartnerei*, 1930. Jena.

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anxious to know the result of the work which was reported to be proceeding. It may turn out that these leaves are really incapable of producing shoots. Nevertheless, it would be interesting to know how long they could be kept artificially growing and what other peculiarities, if any, of behaviour they showed.

BENARES HINDU UNIVERSITY. N. K. TIWARY.

February 1, 1935.

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PROCEEDINGS OF THE ANNUAL MEETING OF THE BOMBAY NATURAL HISTORY SOCIETY.

The Annual General Meeting of the Society was held at the Prince of Wales' Museum on Wednesday the 3rd April, 1935, at 6-15 p.m. Rev. Father J. F. Caius, S.J., was in the Chair.

AGENDA.

1. Reading of the Annual Report of the Committee.
2. Presentation of Balance Sheet and Statement of Accounts for the past year.
3. Election of the Committee.
4. Such other business as may be properly brought before the meeting.

Mr. P. M. D. Sanderson, Honorary Secretary, announced the election of 47 new members since the last meeting. The total number of members for 1934 was 970 as compared with 954 in 1933, exclusive of Life Members of which we have 200. This membership includes His Excellency the Viceroy and Governors of every Province in India and Burma and Ceylon.

The Honorary Secretary then presented the Society's Annual Report for the year 1934. The Report gives a Survey of the Scientific activities of the Society.

BOMBAY NATURAL HISTORY SOCIETY.

OFFICE BEARERS—1935.

Patrons.—His Excellency The Viceroy of India; H. R. H. the Prince of Wales, K.G.

Vice-Patrons.—H. H. The Maharao of Kutch, G.C.S.I., G.C.I.E.; H. H. The Maharaja of Jodhpur, K.C.S.I., K.C.V.O.; H. H. The Maharajah of Rewa, K.C.S.I.; H. H. The Maharaja of Bhavnagar; H. H. The Maharaja of Travancore; Mr. F. V. Evans, Liverpool; Sir David Ezra, Kt., F.Z.S., Calcutta; Mr. A. S. Vernay, New York and London.

President.—H. E. The Right Hon'ble Lord Brabourne, G.C.I.E., M.C.

Vice-Presidents.—H. H. The Maharao of Kutch, G.C.S.I., G.C.I.E.; The Hon'ble Mr. R. D. Bell, C.S.I., C.I.E., I.C.S.

Executive Committee.—Right Revd. R. D. Acland, Bishop of Bombay, Mr. Farrokh E. Bharucha, Major S. L. Bhatia, I.M.S., Rev. Fr. J. F. Caius, S.J., Mr. C. B. B. Clee, I.C.S., Mr. Alwyn Ezra, F.R.G.S., F.Z.S., Mr. J. B. Greaves, M.L.C., Mr. J. G. Ridland, Lt.-Col. S. S. Sokhey, I.M.S., Mr. A. Forrington (*Honorary Treasurer*), Mr. P. M. D. Sanderson, F.Z.S. (*Honorary Secretary*), Mr. H. M. McGusty, Bombay.

Advisory Committee.—Dr. C. F. C. Beeson, D.Sc., M.A., I.F.S., Dehra Dun. Mr. T. R. Bell, C.I.E., I.F.S. (Retd.), Karwar. Lt.-Col. R. W. Burton, I.A. (Retd.), Coonoor. Mr. C. H. Donald, F.Z.S., Dharmsala. Lt.-Col. F. C. Fraser, F.R.E.S., I.M.S. (Retd.), England. Dr. F. H. Gravely, D.Sc., Madras. Mr. S. F. Hopwood, I.F.S., Rangoon. Mr. C. M. Inglis, M.B.O.U., F.Z.S., Darjeeling. Mr. R. C. Morris, F.R.G.S., F.Z.S., Coimbatore. Major E. G. Phythian Adams, F.Z.S., I.A. (Retd.), Nilgiris. Dr. Baini Prashad, D.Sc., Calcutta. Mr. H. C. Smith, I.F.S., Maymyo. Lt.-Col. C. H. Stockley, O.B.E., D.S.O., M.C., Africa. Mr. J. H. Williams, Coimbatore.

ANNUAL REPORT OF THE BOMBAY NATURAL HISTORY SOCIETY. FOR THE YEAR ENDING 31ST DECEMBER 1934.

ADMINISTRATION.

President.—H. E. The Right Hon'ble Lord Brabourne, G.C.I.E., M.C.

Vice-Presidents.—H. H. The Maharao of Kutch, G.C.S.I., G.C.I.E.; Rev. E. Blatter, S.J., Ph.D., F.L.S.; The Hon'ble Mr. R. D. Bell, C.S.I., C.I.E., I.C.S.

Executive Committee.—Right Revd. R. D. Acland, Bishop of Bombay, Mr. Farrokh E. Bharucha, Rev. Fr. J. F. Caius, S.J., Mr. Alwyn Ezra, F.R.G.S., F.Z.S., Mr. J. B. Greaves, M.L.C., Prof. V. N. Hate, B.Sc., Mr. J. G. Ridland,

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Lt.-Col. S. S. Sokhey, I.M.S., Mr. A. Forrington (*Honorary Treasurer*), Mr. P. M. D. Sanderson, F.Z.S., Sir Reginald Spence, Kt., M.L.C., F.Z.S. (*Joint Honorary Secretaries*), Bombay.

Advisory Committee.—Dr. C. F. C. Beeson, D.Sc., M.A., I.F.S., Dehra Dun. Mr. T. R. Bell, C.I.E., I.F.S. (Retd.), Karwar. Lt.-Col. R. W. Burton, I.A. (Retd.), Coonoor. Mr. C. H. Donald, F.Z.S., Dharmsala. Lt.-Col. F. C. Fraser, I.M.S., Coimbatore. Dr. F. H. Gravely, D.Sc., Madras. Mr. S. F. Hopwood, I.F.S., Rangoon. Mr. C. M. Inglis, M.B.O.U., F.Z.S., Darjeeling. Mr. R. C. Morris, F.R.G.S., F.Z.S., Coimbatore. Major E. G. Phythian Adams, F.Z.S., I.A. (Retd.), Nilgiris. Dr. Baini Prashad, D.Sc., Calcutta. Mr. H. C. Smith, I.F.S., Burma. Lt.-Col. C. H. Stockley, O.B.E., D.S.O., M.C., Meerut.

Staff.—S. H. Prater, M.L.C., J.P., C.M.Z.S. (*Curator*). C. McCann, F.L.S., V. S. LaPersonne (*Assistant Curators*).

THE HONORARY SECRETARY'S REPORT FOR THE YEAR 1934.

The Society's Journal.

Three numbers of Volume XXXVII were published during the year under review.

Mammals.—Mr. Pocock concludes his paper on the Palm-Civets or Toddy Cats of the genus *Paradoxurus* and *Paguma*, inhabiting British India, begun in Volume XXXVI. For the Common Toddy Cat, described by Blanford under the name *Paradoxurus niger*, the author adopts Gray's specific name *hermaphroditus*, which recent Zoologists following Blanford's lead restricted to the Malayan Palm Civets. The Typical Palm Civet—*Paradoxurus h. hermaphroditus* is given as ranging southwards of the Narbada River through Southern India and Ceylon. 8 additional races distributed over Kashmir, Northern and Central India, Assam and Burma are described by the author. Among these are 3 new forms one of which *P. h. scindiae* is named after the late Maharaja Sir Madhowrao Scindia of Gwalior. His Highness was one of the first subscribers to the Mammal Fund which enabled the Society to carry out its extensive Mammal Survey from which so great a harvest of knowledge has accrued. In dealing with the Himalayan Palm Civets (*Paguma*) Mr. Pocock now recognises two species. *Paguma lanigera* from Tibet is based on a single known specimen believed originally to have come from the northern region of Nepal, but now known to have been obtained at Tingree in Tibet. The second species, the Himalayan Palm Civet *Paguma larvata* (*Paradoxurus grayi* of Blanford), ranges through the Western Himalayas, Nepal, Assam, Burma, the Shan States and the Andaman Island. Over this wide range the author recognises 7 different races.

Mr. McCann publishes an interesting note on the habits of the Flying Fox. The ground under the fruit trees where these bats have fed over night is generally covered with wholly or partially chewed fruit. These have wrongly been taken to be their droppings. From careful observation and examination of the stomach contents of specimens, the author was led to the conclusion that these bats live exclusively on the nectar, fruit juices and such fruits as liquefy easily in the mouth. No solids pass into the stomach of the bat. Here then is the basis of the legendary belief prevalent in many parts that the flying fox has no anus but passes its excreta from the mouth.

The various papers on Indian Mammals which have appeared in the Society's *Journal* and other kindred publications are a necessary preliminary to the long awaited and long overdue revision of Blanford's Volume on Mammalia in the *Fauna of British India* Series, which was sanctioned by the Secretary of State many years ago. It is confidently hoped that the authorities at the British Museum will make a special effort to expedite its publication. The greater part of the very large collections obtained by the Society during the Mammal Survey has been temporarily placed at the disposal of the British Museum for purposes of reference during the preparation of the new *Fauna*. There are however various institutions in India and abroad who contributed to the funds of the Survey on the understanding that they would receive a share of these collections in due course. The prolonged delay in the publication of the new edition has prevented the Society so far from discharging its obligation in this respect.

Birds.—Parts VII, VIII and IX of the Report of the Vernay Scientific

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Survey of the Eastern Ghats (Ornithological) were published during the year. The Report provides a comprehensive list of the Birds of the Madras Presidency based on material obtained by the Survey and on past records.

In the report the authors deal *de novo* with the distribution and status of many species. The parts published during the year deal with the Pipits, Larks, Flower Peckers, Wood Peckers, Barbets and Cuckoos. Among the new subspecies described is a new race of the Golden-backed Woodpecker *Brachypternus b. tehminae*, which the authors have named as tribute to Mrs. Salim A. Ali, who accompanied and helped her husband Mr. Salim Ali on various Ornithological Surveys frequently under trying conditions.

The thanks of the Society are due both to Mr. Kinnear and Mr. Whistler, joint authors of the Report, which forms one of the most important contributions to Indian Ornithology made in recent years. It provides considerable amendments to and revisions of the distribution and status of species ascertained through the Survey subsequent to the publication of the *New Fauna*.

The Hyderabad Ornithological Survey.—Mr. Salim A. Ali concludes his Report on the Ornithological Survey of Hyderabad, Parts IV and V of which were published. Mr. Ali's Survey is confined mainly to the Eastern portions of the State. His plan to include the Northern and Western districts was unfortunately given up for want of funds. We hope that H. E. H. the Nizam's Government will make it possible for him in the near future to complete the Survey, which he has carried out so far with his usual efficiency and thoroughness.

Mr. Kingdon Ward's and Lord Cranbrook's Expedition to the Sources of the Irrawaddy River.—In 1930, Capt. Kingdon Ward and Lord Cranbrook made an expedition to the sources of the Irrawaddy River. While the object of the expedition was mainly Botanical, they collected some 152 birds, 340 mammals and a number of reptiles. In his paper on the 'Birds of the Adung Valley' Mr. N. B. Kinnear published a systematic list of the birds obtained on the expedition; while Lord Cranbrook gives an interesting narrative of the expedition. The collection of Birds includes two new races, but its main interest lies in the considerable addition made to our knowledge of the distributions of a number of species, which were believed to be confined mainly to the Himalayas and which were hitherto unknown to occur in Burma.

Mr. H. St. J. Philby's Journey through the 'Empty Quarter' in Arabia.—Mr. Philby, the noted traveller and Arabian explorer, describes his journey through the Rub al Khali in his fascinating book the *Empty Quarter*. In spite of innumerable difficulties he collected a number of birds, which were subsequently presented to the British Museum by H. M. King Abdul Aziz. Mr. Philby's collection and the notes made by him formed the basis of a paper by Mr. N. B. Kinnear published in Volume XXXVII, No. 3. The paper helps to reveal the species which inhabit this desolate and hitherto unknown region. The thanks of the Society are due to Mr. Kinnear for this interesting paper. His continued association with the work of the Society for which he did so much is greatly appreciated.

Mr. Stuart Baker contributed a description of the Long-tailed Duck *Clangula hyemalis*, an interesting addition to the Indian avifauna. A male of this duck changing from eclipse into winter plumage was shot by Capt. A. E. Dredge at Chaman, British Baluchistan, on the 18th October, 1933.

A feature of the Ornithological contributions to the *Journal* is the numerous faunistic lists recording the bird life of various towns and districts or provinces in the Indian Empire or the countries which adjoin it. During the year the following lists were published:—Birds of Ghazipur by Rev. F. S. Briggs; Birds of Fort Munro, Sulaiman Hills, by Mr. H. W. Waite. Mr. Higgins completed his interesting account of the Game Birds and animals of Manipur.

Fishes.—Mr. Mukerji completes his Report on the collection of fishes made by Col. R. W. Burton in the Myitkyina District, Upper Burma.

Dr. Hora of Zoological Survey of India contributes an interesting paper on the 'Wanderings of the Bombay Duck (*Harpodon nehereus*)'. From the economic standpoint, this is one of the most important food fishes of the Bombay Coast. At the present time, we know little of the factors which govern the mass movement of these fishes, which appear in abundance on the Bombay Coast during the monsoon and are comparatively scarce at the other

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seasons. From the meagre data available the author discusses the various factors which may be responsible for the mass movements of 'Bombay Duck'. He indicates that the problem requires more detailed investigation. At present we know nothing about the factors which control the periodic migration of any of our important food fishes. It is clear that investigation on these lines would be of considerable advantage to the industry and would afford data for placing the exploitation of our waters on a sounder and more scientific basis.

We also published Mr. Hamid Khan's paper on the 'Habits and Habitats of the Food Fishes of the Punjab'.

Insects.—In Volume XXXVI Mr. Martin E. Mosely began his series of articles on the 'Indian Caddis-Flies'—which when completed will form a standard work on *Indian Trichoptera*. Part II of the serial, dealing with the classification of these insects, was published during the year.

There is a paper on 'Indo-Ceylonese Chalcid Flies' by Mr. T. V. Ramakrishna Ayyar and V. Margabandhu. It is a continuation of the previous lists published by the senior author. The paper serves to bring up to date our records of the Indo-Ceylonese forms. In view of the economic importance of these minute wasp-like creatures as natural enemies of important crop pests, the data provided will be of some value to those agricultural entomologists interested in the biological control of insect pests by insect parasites.

Another paper dealing with Economic Entomology is by Mr. C. Cherian on 'South India Syrphids'. Commonly known as 'Hover flies', the Syrphids play an important part in checking one of the worst insect pests of cultivated crops viz. the *aphids*. Mr. Cherian also publishes a further note on *Argyria fuscivenalis*, a Pyralid caterpillar pest of the *Crataeva religiosa*, an ornamental tree common in gardens together with measures for its control. The paper gives information on the distribution of species, hosts, etc., of the South Indian forms. Mr. V. Margabandhu contributes an Annotated List of Indo-Ceylonese Termites. The available literature dealing with the various species is recorded, together with notes on habits, distribution, etc.

Botany.—Parts XXIII, XXIV and XXV of the Revision of the Flora of the Bombay Presidency by the late Revd. E. Blatter were published during the year.

The death of Father Blatter in May 1934 has removed a great figure from the Indian Botanical World, and a valued counsellor and friend of the Society with which he was associated since 1904. An obituary notice and a list of his numerous scientific contributions to Asiatic Botany were published in Volume XXXVII, No. 2.

The Flora of Waziristan by E. Blatter and J. Fernandez was completed. Certain orders have been omitted from these papers, which were published in 5 parts. They are being worked out by a specialist and will be published later.

Popular Articles.—Mr. Stuart Baker continues his serial on 'Waders and Semi-Sporting Birds' which is intended to supplement his previous Volumes on Indian Game Birds. Three Volumes of this series have been so far published by the Society—the fourth volume will deal with the Partridges and Quails, and the fifth with the Wading Birds.

Parts XIV, XV and XVI of 'Some Beautiful Indian Trees' by Father Blatter and Mr. W. S. Millard are issued. 24 of our more conspicuous and ornamental trees have now been illustrated in colour and described. It is intended to complete the series with descriptions of 6 others, making 30 in all. Additional plates have been printed to enable the Society to issue the serial in book form.

By courtesy of the *Field* we were able to reproduce Mr. E. H. Peacock's articles on 'Tsaing and Bison in Burma'. They are illustrated with photographs taken from life by the author. Equally interesting are the reminiscences of that veteran sportsman Mr. Thom, whose articles on 'Bison and Tiger Shooting' were published during the year.

The Editors of the *Journal* once more make an appeal to members to send in accounts of sport and travel in India, and take this opportunity of thanking all those who have contributed notes and articles during the year. As usual the section of the *Journal* containing the Miscellaneous Notes has been full of interest. It is a feature which we would like to develop further.

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Wild Animals of the Indian Empire and the Problem of their Protection.—Part II of the series of articles on 'the Wild Animals of the Indian Empire' dealt with Deer and Antelope. Part III on the Carnivores is now ready for publication. Further issues will deal with the Primates and the Rodents. The cost of the numerous coloured and black and white plates issued with these articles has been met by Mr. F. V. Evans. The Committee of the Society once again would like to place on record their thanks and appreciation of the assistance received from Mr. F. V. Evans during the year. The purpose of these articles is to provide a well illustrated popular handbook of the animals of the Indian Empire with a view to educating public opinion and creating a wider interest in the preservation of wild life. To give wider publicity to the question, the articles are being issued separately in pamphlet form. A large number of copies have been distributed to various agencies and individuals and the publication has received wide attention both in the English and vernacular papers. Accompanying Part II of this serial are contributions by Mr. Milroy, Conservator of Forests, Assam, and Mr. F. W. Champion, Deputy Conservator of Forests, United Provinces, on the problem of protecting wild life in their respective provinces. Our thanks are due to both the gentlemen for their valuable contributions. An interesting development of the whole question of Preservation of Wild Life in India was the recent Inter-Provincial Conference convened by the Government of India at Delhi in January 1935 at which the Society was represented by the Curator, Mr. S. H. Prater.

The Conference was instrumental in making a number of detailed recommendations for the better protection of wild animals both inside and outside forest areas. If these recommendations are accepted and put into force by the various provincial governments, much will have been accomplished to improve the deplorable conditions which exist in many parts of the country. But while the Conference made numerous recommendations of detail—the broad issues underlying the whole problem remain unsettled. Among these is the need of fully exploring the possibility of creating permanent sanctuaries wherever necessary for giving permanent shelter to wild life. Equally important is the question of creating a definite agency within the forest department for administering the laws relative to the protection of wild animals. To fix the responsibility on an already overworked and under-staffed department without providing it with adequate means to enforce these laws will not improve the position. The same holds good regarding the protection of animal life outside forest areas, where their destruction is now greatest. Mere legislation without the means to enforce it, must remain, as at present, quite useless in preventing the destruction of wild life outside forest areas both in and out of season.

Publications.—The Jubilee Number of the Society was issued free during the year to members. The thanks of all members are due to Mr. A. S. Vernay, Vice-Patron of the Society, who contributed Rs. 1,500 towards its cost. The book gives an account of the history and the work of the Society during the past 50 years. Started by 8 residents of Bombay, the Society has exerted an influence and carried out a work which has reached far beyond this city and which has left its impression on the annals of scientific progress in India. All honour to those who laboured in the building up of it. The fine Natural History Museum in Bombay, the many volumes of the Society's *Journal*—and its numerous publications are a lasting testimony to the interest and devotion of its members in all parts of the Indian Empire and in countries abroad.

The Museum.—The new wing of the Prince of Wales' Museum to which the Natural History Section is to be transferred is nearing completion. The interior architecture has been specially designed to meet the requirements of a modern Natural History Museum. Special attention has been paid to the lighting of the galleries. The new building gives the Society a unique opportunity of developing the Natural History Section, and placing the whole standard of exhibition on a modern basis. Designs for the internal arrangement of the galleries are being prepared by Mr. Prater and his staff. An attempt is being made to provide the maximum amount of floor space for the free movement of visitors. The show cases are built into or along the walls of the gallery. Provision is made for a series of large diorama groups exhibiting various species of animals, birds, reptiles and fishes in their natural environment, on the lines of the groups exhibited in the Natural History Museums

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at New York and at Berlin. An attempt is also being made to introduce a harmonious colour scheme for show cases, walls and flooring in each gallery which will be attractive and pleasing, and new effective methods of labelling are being introduced.

ACCOUNTS.

Revenue Account.—This shows a loss of Rs. 4,847-8-9, which is the loss shown on the Balance Sheet. It is a considerable loss, and if there were no other factors to be taken into account, the position of the Society would be serious.

Publication account.—The method adopted by the Society with regard to its publication is to debit the whole cost of a publication to Publication Account and to credit against that the whole of the sale proceeds of that publication, until such time as that publication stands at no value in the Publication Account. During the year under review, the Society has received Rs. 3,428-6-11 by sale of publications and this sum has been utilised in this manner to write down the value of the Society's stock of publication. The Publication Account is by this means kept in a very healthy position and in future years, the Society can look forward to a reasonable income from this Account from sale of publications which have been written down to nil in this manner.

For example, in the revenue account, it will be noticed that an item of Rs. 711 appears for sales of Game Books, Vols. I and II. The Society has a considerable stock of Game Books, Vols. I and II, the whole cost of which has been written off in previous years. The sale proceeds from these books now appear as net profit.

Balance Sheet.—Investments are shown as per last balance sheet or market value, whichever is lower, and considerable capital appreciation is hidden in this manner. The Society has, since the Balance Sheet was made up, disposed of its holdings of 3½ per cent Government Paper to the face value of Rs. 38,000, and has realised from this sale Rs. 36,695-15-8 or Rs. 7,549-11-8 more than the value shown in the present Balance Sheet. This appreciation alone more than counterbalances the loss for the year 1934.

Life Membership Fees.—In 1933 the Society received Rs. 1,950 on account of Life Membership Fees, and this item was in that year taken into Revenue account, as it was felt that the reserve shown in the Balance Sheet on account of Life Membership fees had reached an adequate figure. This year only one Life Membership fee has been received—Rs. 350, and this sum has not been taken into general revenue account, but has been used to increase the Society's reserve for Life Membership Fees.

This now stands at Rs. 47,500. Under rule 7 of the Memorandum of Association of the Society, Life Members' subscription may be taken into revenue provided the total investments of the Society are in excess of the toal of Life Membership subscriptions. The market value of our investments exceeds this figure considerably.

COMPARISON OF REVENUE AND EXPENDITURE WITH THE PREVIOUS YEAR.

Revenue	1933	1934	Expenditure	1933	1934
Subscriptions ...	23,467	22,810	Salaries ...	19,060	19,652
Entrance Fees ...	1,070	820	Prov. Fund	1,539	1,556
Sale of Journals.	2,093	1,605	Rent ...	2,436	2,436
Interest ...	3,507	3,580	Journals ...	10,595	8,679
Sundries ...	3,897	1,198	Sundries ...	2,856	2,537
Loss	2,452	4,847			
Total Rs. ...	36,486	34,860	Rs. ...	36,486	34,860

General.—The loss on the year's working was Rs. 4,847-8-9 as compared with Rs. 2,452-8-9 the previous year. Expenses have been cut down as much

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as possible, the *Journal* reduced in cost and the staff is still working on a cut rate of pay. The financial position is sound, but we cannot continue to work at a loss. Our revenue depends almost entirely on the membership, and considering the acute economic depression during the last 2 or 3 years this has been maintained fairly well. So far as the present year is concerned the appreciation in securities was fortuitous. It is hoped conditions will be better now and that our membership will be increased, otherwise there is no alternative but to cut expenditure to meet our revenue. But this cannot be done without the risk of impairing the efficiency of the staff and the value of the *Journal*, which is the main attraction to members and the cost of which has already been considerably reduced.

P. M. D. SANDERSON,
Honorary Secretary.

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BOMBAY NATURAL HISTORY SOCIETY.

BALANCE SHEET AS AT 31st DECEMBER 1934.

LIABILITIES	Rs A P	Rs A P	ASSETS	Rs A P	Rs A P
Life Membership fees :	.....	47,500 0 0	*Investments as per last Balance Sheet or market value on 31st December 1934, whichever is lower :*		
Donations for specific objects unexpended:			Rs. 28,000 Govt. 3½% Pro. Notes at Rs. 74-9/16%	20,877 8 0	
Show Cases, etc. in existing building A	2,402 7 4		,, 10,000 ,, do do. 82-11/16%	8,268 12 0	
Show Cases in new building B.	17,784 9 0		,, 15,000 ,, 5% 1945-55 Loan at par	15,000 0 0	
Jubilee Number Fund	957 13 0		,, 8,000 ,, 6½% Dev. Loan ,,	8,000 0 0	
Journal Fund	6,282 14 0		,, 14,000 Port Trust 4% Bond at 77%	10,780 0 0	
Vernay-Hopwood Chindwin Expedition	518 6 9		,, 15,000 Imp. ,, 4% ,, at 76%	11,400 0 0	
		27,946 2 1			74,326 4 0
Sundry Creditors :			*Investments on account of Show Cases in New Building :*		
Printers of Journal	2,782 5 10		Fixed Deposit with Eastern Bank, Ltd., Bombay	10,300 0 0	
For Expenses	250 0 0		Rs. 5,700 Govt. 5½% Loan 1938-40 at par	5,700 0 0	
		3,032 5 10	,, 500 ,, 5% ,, 1945-55 ,,	500 0 0	
					16,500 0 0
Surplus Assets :			*Cash—*		
Balance as per last Balance Sheet	34,856 5 11		With National Bank of India Ltd., Bombay	5,361 0 11	
Less—Loss on Revenue Account	4,847 8 9		With National Bank of India Ltd., London, £30-17 at 1/6	411 5 4	
		30,008 13 2	On hand	150 0 0	
					5,922 6 3
			Sundry Debtors :		1,716 4 0
			Furniture :		
			Balance as per last Balance Sheet	1,677 0 0	
			Additions during the year	25 0 0	
				1,702 0 0	
			Less Depreciation	50 0 0	
					1,652 0 0
			Loan to Staff:		413 0 0
			Publications, excluding Journals:		
			As certified by the Hon. Secretary		300 0 0
			Game Books, Vol. III: Stock on hand as certified by the Secretary		1,011 9 0
			Bird Charts, Stock on hand as certified by the Secretary		3,691 14 3
			Bates' Bird Life : Stock on hand as certified by the Secretary		1,106 0 6
			Butterfly Books : Stock on hand as certified by the Secretary		333 8 10
			Beautiful Indian Trees : Stock on hand as certified by the Secretary		1,514 6 3
Total		1,08,487 5 1	Total		1,08,487 5 1

Note.—A stock of 20,400 old Journals and the Valuable Research Collection and Library of 2,550 Volumes have not been taken into account on the Asset side of the Balance Sheet.

We have prepared the above Balance Sheet from the cash book and from the information given to us, and have verified the investments.

In our opinion, such Balance Sheet represents a true and correct view of the state of the Society's affairs according to the best of our information and explanations given to us.

BOMBAY, *27th February, 1935.*

(Sd.) A. F. FERGUSON & CO.,
Chartered Accountants, Auditors.

(Sd.) A. FORRINGTON,
Honorary Treasurer.

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(Sd.) A. F. FERGUSON & CO.,
Chartered Accountants, Auditors.

(Sd.) A. FORRINGTON,
Honorary Treasurer.

BOMBAY NATURAL HISTORY SOCIETY.

REVENUE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER 1934.

	Rs A P	Rs A P		Rs A P	Rs A P
To Salaries	19,652 0 6		By Subscriptions	22,810 7 2	
,, Society's Contribution to Staff Provident Fund	1,556 8 0		,, Entrance Fees	820 0 0	
,, General charges	373 7 8		,, Sales of Journals	1,605 9 8	
,, Rent	2,436 0 0		,, Interest on Investments	3,580 14 2	
,, Stationery and Printing	242 4 6		,, Taxidermy Department	56 5 0	
,, Postage	1,125 10 9		,, Sales of Game Books, Vols. I & II ..	711 0 11	
,, Library	395 4 9		,, Society's small Publications	428 8 0	
,, Audit Fee	250 0 0				30,012 12 11
,, Insurance	100 0 0		,, Balance of Expenditure over Income ...		4,847 8 9
,, Furniture Depreciation	50 0 0				
,, Cost of Printing Journals	8,679 1 6				
		34,860 5 8			
Total ...		34,860 5 8	Total ...		34,860 5 8

PUBLICATION ACCOUNT FOR THE YEAR ENDED 31st DECEMBER 1934.

	Rs A P	Rs A P		Rs A P	Rs A P
To Stock of Bird Charts and Albums ...	5,962 9 7		By Sales of Bird Charts and Albums ...	3,002 0 10	
,, Expenses during the year	731 5 6		,, Stock on hand	3,691 14 3	
		6,693 15 1			6,693 15 1
,, Stock of Game Books, Vol. III	1,098 3 8		,, Sales of Game Books, Vol. III	165 0 0	
,, Expenses during the year	78 5 4		,, Stock on hand	1,011 9 0	
		1,176 9 0			1,176 9 0
			,, Sales of Bates' Bird Life	91 6 0	
,, Stock of Bates' Bird Life	.....	1,197 6 6	,, Stock on hand	1,106 0 6	
					1,197 6 6
,, Stock of Butterfly Books	496 2 10		,, Sales of Butterfly Books...	170 0 0	
,, Expenses during the year	7 6 0		,, Stock on hand	333 8 10	
		503 8 10			503 8 10
,, Stock of Beautiful Indian Trees	.....	1,514 6 3	,, Beautiful Indian Trees...	.....	1,514 0 3

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BOMBAY NATURAL HISTORY SOCIETY.

INCOME AND EXPENDITURE ACCOUNT OF DONATIONS FOR SPECIFIC PURPOSES FOR THE YEAR ENDED 31st DECEMBER, 1934.

	Rs a p	Rs a p		Rs a p	Rs a p
To Expenditure on Show Cases, etc. ...	1,527 6 0		By Unexpended Balance for Show Cases, as per last Balance Sheet ...	2,133 11 4	
,, Balance carried to Balance Sheet ...	2,402 7 4	3,929 13 4	,, Donations for the Modeller's Salary etc.	1,796 2 0	3,929 13 4
,, Balance Carried to Balance Sheet ...		17,784 0 0	,, Unexpended balance for Show Cases in New Building as per last Balance Sheet	17,147 2 4	
,, Expenses on Printing Plates, etc. ...	542 3 0		,, Interest on Building Investments ...	37 6 8	17,784 9 0
,, Balance carried to Balance Sheet ...	957 13 0	1,500 0 0	,, Jubilee Fund		1,500 0 0
,, Expenditure on Printing Plates for Journal	4,127 11 0		,, Balance as per last Balance Sheet in Special Journal Fund...	7,533 7 0	
,, Balance carried to Balance Sheet ...	6,282 14 0	10,410 9 0	,, Donations received during the year ...	2,877 2 0	10,410 9 0
,, Expenditure during the year	1,467 12 6		,, Vernay-Hopwood Chindwin Expedition		1,986 3 3
,, Balance carried to Balance Sheet ...	518 6 9	1,986 3 3			

BOMBAY, *27th February, 1935.*

Examined and found correct.
(Sd.) A. F. FERGUSON & CO.
Chartered Accountants, Auditors.

(Sd.) A. FORRINGTON.
Honorary Treasurer.

PRINTED BY W. H. WARREN AT THE DIOCESAN PRESS, MADRAS, AND PUBLISHED BY MR. P. M. D. SANDERSON FOR THE BOMBAY NATURAL HISTORY SOCIETY, BOMBAY.

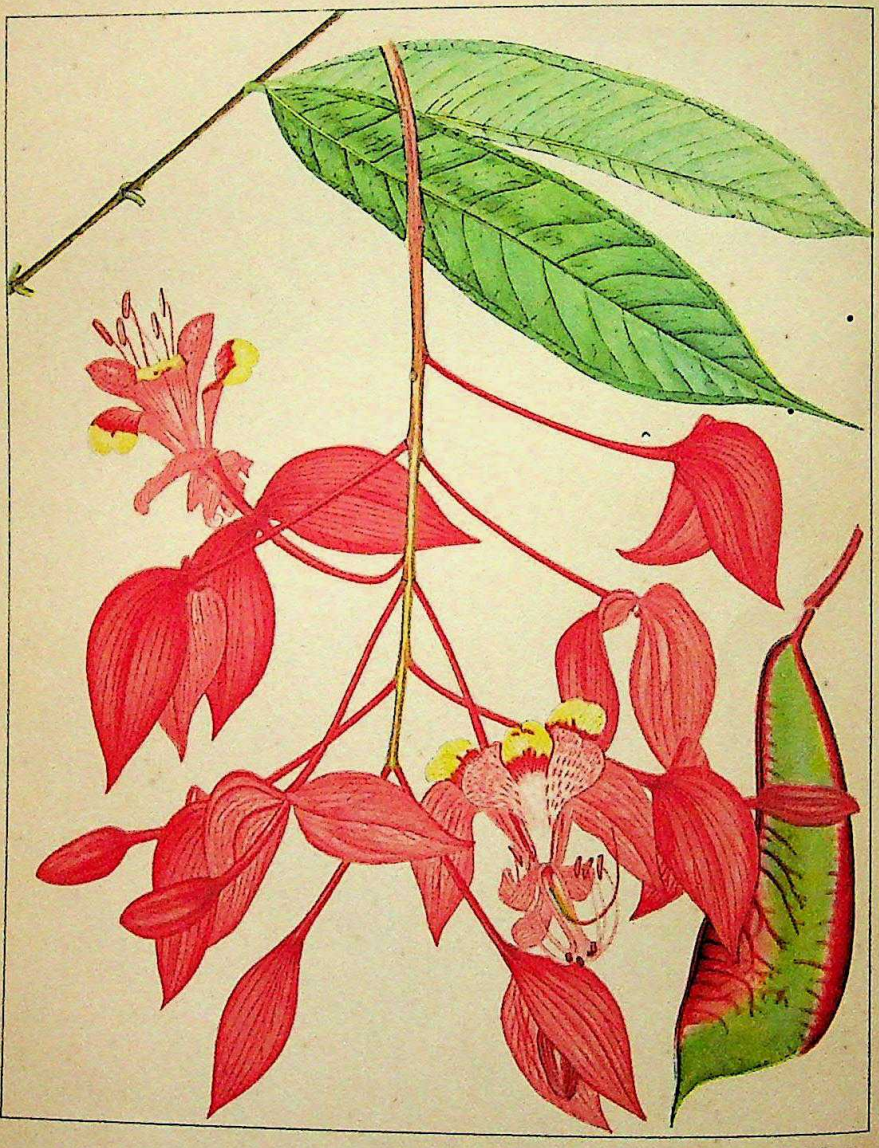
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John Bale Sons & Danielsson, Ltd London

The Noble Amherstia
Amherstia nobilis, Wall.

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JOURNAL
OF THE
Bombay Natural History Society.

DECEMBER, 1935. VOL. XXXVIII. No. 2.

SOME BEAUTIFUL INDIAN TREES.

BY

THE LATE E. BLATTER, S.J., PH.D., F.L.S.,

and W. S. MILLARD, F.Z.S.

PART XIX.

(*With two coloured plates, one black-and-white plate and two text-figures*).

(*Continued from page* 94 *of volume* XXXVIII).

THE NOBLE AMHERSTIA.

Popular names: *Thawka*, Burm.

Amherstia nobilis Wall. Belongs to the family *Leguminosæ*. The name *Amherstia* is in honour of Countess Amherst and her daughter, Lady Amherst, promoters of Indian botany: *nobilis*, on account of the exquisite beauty of the flowers.

Description: A moderate-sized tree 30-40 ft. high, much like the Asoka (*Saraca indica*) in general appearance, when not in bloom. The stout trunk is covered with thick, uneven, dark, ashy-grey bark. The spreading branches are overlaid with dense dark-green foliage. The young shoots and leaves are pendulous and downy. The leaves, 1-1½ ft. long, are composed of 6-8 pairs of opposite leaflets. The leaflets 6-12 in. long by 1-1½ in. wide are distantly arranged; in shape oblong with almost parallel sides, narrowing slightly to the base and suddenly tapering off to a fine point at the apex. They are smooth and dark green above, paler

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and softly hairy below. At the base of the leaf-stalk there are two leaf-like lance-shaped and sharply pointed stipules, 1-1½ in. long, which fall off soon after the leaf develops.

The flowers are arranged in very large candelabra-like racemes which arise from the axils of the leaves, and frequently attain 3 ft. in length. The reddish branches of the racemes support from 20 to 26 beautiful flowers. The individual flower stalks together with the large leaf-like bracts below the calyx are intensely red. The calyx is composed of 4 sepals united into a tube and a little shorter than the bracts. The flower is composed of 5 conspicuous petals. The large standard is 3 in. long by 2 in. at its widest part, reversedly heart-shaped with rounded lobes and toothed margins. In colour it is red with a splash of white between the lobes and a roundish yellow spot in the centre. The wing petals are like the standard but much narrower, spreading and reflexed. The two keel petals are small. The stamens are disposed in two sets, one composed of 9, the other solitary. The anthers are large and dark-green in colour. Ovary flat and densely hairy. The fruit is a broad pod.

Flowers: It flowers during the greater part of the year, but chiefly from January to March (Troup).

Distribution: Indigenous in Tenasserim, Burma (Troup).

Uses: Cultivated as an ornamental tree in the moister parts of Burma and Southern India.

Gardening: The tree is somewhat difficult to cultivate, being delicate when young and requiring a rich soil and a warm moist equable climate. It may be raised from seed in pots or baskets, but can best be propagated by layering in the hot season and planting out during the rains. It is successfully cultivated in Ceylon, but seldom ripens its seeds there (Troup).

This is perhaps the most beautiful of all flowering trees. The large graceful sprays of vermilion and yellow flowers drooping from every branch, set in the deep green foliage present an aspect of astonishing loveliness, scarcely equalled by any tree in the world. Very remarkable and striking are the long hanging rich red or purplish clusters in which the young leaves appear.

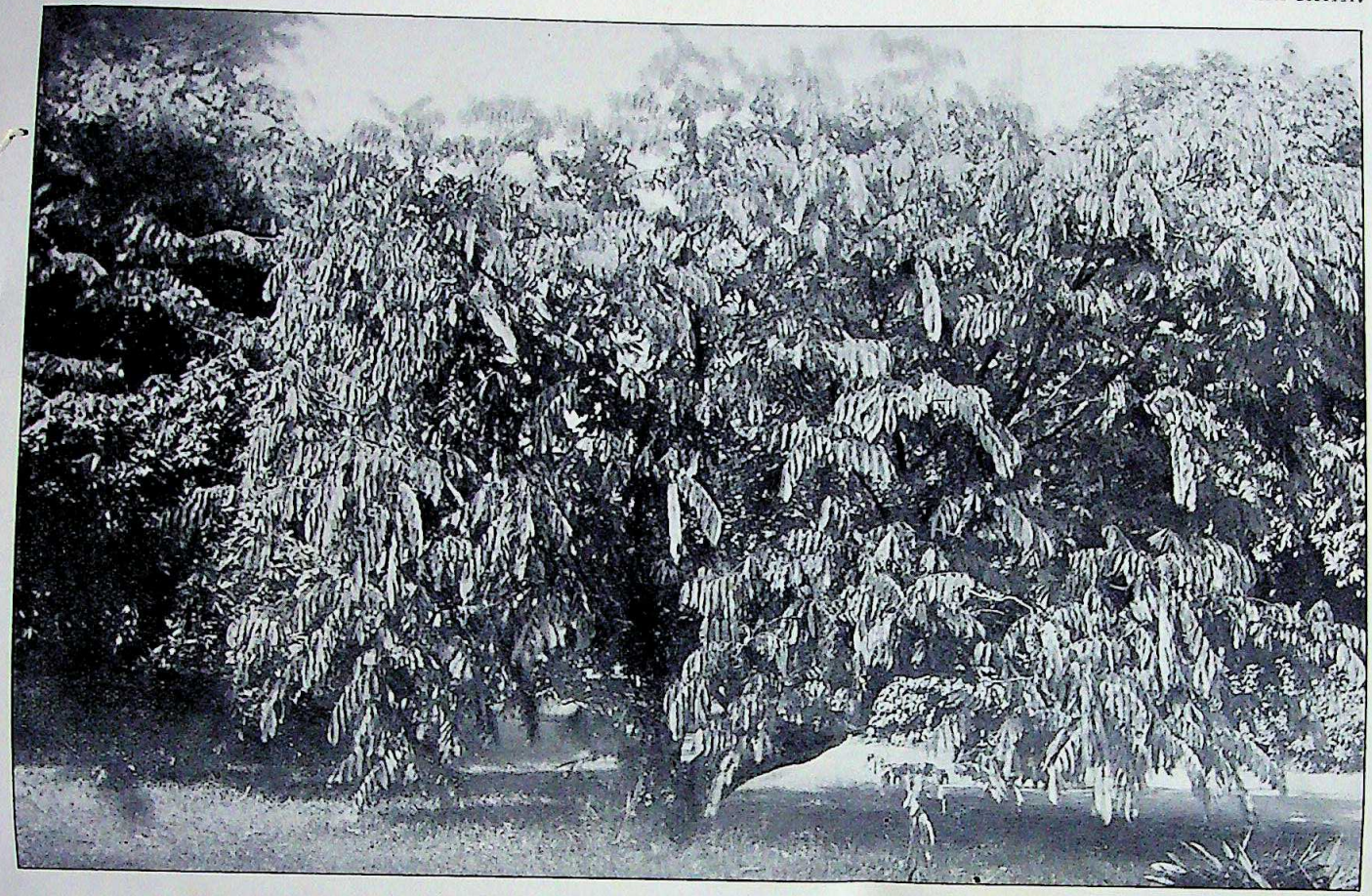
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A flowering spray of *Amherstia nobilis*.

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The Noble Amherstia Tree
(*Amherstia nobilis*).

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Photos by

Colville's Glory (*Colvillea racemosa,* Bojer).



C. McCann.

Flowers of Colville's Glory (*Colviliea racemosa,* Bojer).

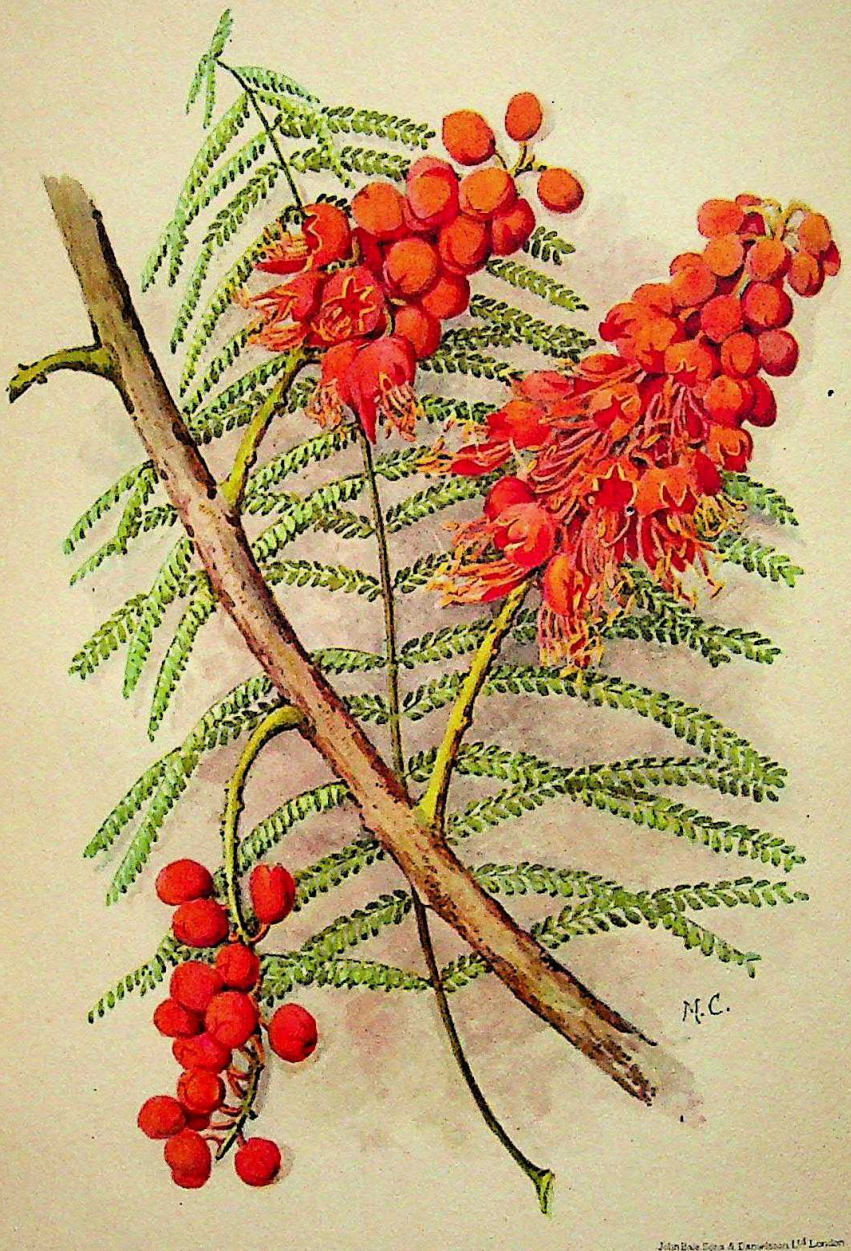
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COLVILLE'S GLORY
Colvillea racemosa, Bojer.
(about ⅓ nat. size)

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Colville's Glory.

Colvillea racemosa Bojer. Belongs to the family *Leguminosae*. The name *Colvillea* is in honour of Sir Charles Colville, Governor of Mauritius; *racemosa* on account of the flowers being arranged in racemes.

Description: A moderate-sized tree 40-50 ft. high with spreading branches. In general form and from the character of its foliage it might be easily mistaken for the Gul Mohur. The leaves of the two trees are very similar. In the present species, the leaf is composed of from 20-30 pinnæ or minor leaves—a Gul Mohur leaf has only 11-18. The pinnæ bear 20-28 pairs of small elliptical leaflets arranged opposite each other. In the Gul Mohur these leaflets are more oblong.

The flowers are very curious and striking. In the bud they are almost nut-like in form and appear in large drooping clusters, the buds diminishing in size as they approach the end of the raceme. The sepals are more or less obliquely shaped in outline and sharply pointed. Externally they are silky to the touch. Their colour ranges from bright orange to red. Internally they are smooth and creamy. The standard petal of the flower is the smallest and not the largest as is usual. It is orange red, and is flanked by two very long narrow erect wing petals, deep red in colour. Opposite the standard petal is the rudimentary boat-shaped keel petal. The 10 stamens are free, 3 of them are inserted below the standard, 2 under the wing petals, 1 under the keel, and 4 under the ovary. The anthers are yellow. The clumps of bright coloured flowers among the feathery grey green foliage give the tree a very striking appearance. The pod is 2-valved and round.

Flowers: In India the tree flowers in July and August but in Madagascar it flowers in April or May.

Distribution: It is supposed to be a native of East Africa, but it was discovered by Bojer, in 1824, on the West Coast of Madagascar, where a single tree was cultivated by the natives. It is the only species of the genus.

Gardening: It is suited to moist or moderately dry low country, and is only propagated from seed. Though it is well worthy of cultivation for its beautiful flowers and foliage, it is seldom seen outside botanical gardens and flower fanciers' collections.

(*To be continued*).

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THE VERNAY SCIENTIFIC SURVEY OF THE EASTERN GHATS.

(Ornithological Section).

BY

Hugh Whistler, M.B.O.U., assisted by N. B. Kinnear, M.B.O.U.

Part XII.

(*Continued from page* 764 *of volume* xxxvii).

Tyto alba stertens Hartert.

Tyto alba stertens Hartert, Nov. Zool., vol. xxxv (1929), 98—Cachar.

Not met by the Survey. The Barn Owl is probably more common and generally distributed than the few records imply. Dewar says it occurs at Madras, and two males from Madras dated March 1877 are in the Hume Collection.

The Hume Collection also contains two undated birds from Calicut. William Davison says that it is rare on the Nilgiris where it lives in holes in rocks. In Travancore, on the other hand, Ferguson says that it is found occasionally in the low country about human habitations. He gives the breeding season as December and January.

I have only seen one specimen from Java and this certainly seemed to be a little more brightly coloured than Indian birds. No Ceylon birds examined.

Tyto longimembris longimembris (Jerdon).

Strix longimembris Jerdon, Madras Jour. Lit. Sci., vol. x (1839), p. 86—Neilgherries.

Very little is known about the distribution of the Grass-Owl in the Presidency, and it was not met by the Survey. On the western side it was procured by William Davison in the Brahmagherries, a male and female dated respectively 19 April 1881 and 14 February 1882 being in the British Museum. In the Nilgiris it was first procured by Jerdon on the grassy side of a hill at 6,000 ft. near Coonoor and the specimen marked 'Madras, Jerdon' in the British Museum is probably this bird, the type. William Davison tells us that he shot it himself on the Nilgiris on several occasions and handled two or three others, so it is probably an uncommon resident in these hills.

Terry was under the impression that an owl flushed from long grass on the hillside at Pulungi in the Palnis was probably of this species.

On the eastern side of the Presidency we have only Jerdon's statement that he had procured the Grass-Owl in the Nellore District, twice, once in long grass when he was hunting florican and once in long reeds in the dry bed of a tank at Yeroor.

Nothing is known about the breeding season in the Presidency. All Indian birds clearly belong to the one race.

Asio flammeus flammeus (Pontoppidan).

Strix flammea Pontoppidan, Danske Atlas, vol. i (1763), p. 617, pl. xxv—Denmark.

The Short-eared Owl was not procured by the Survey, but it is known to be an irregular winter visitor to the Presidency. On the eastern side it is only recorded from the neighbourhood of Madras. Here it was recorded by

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Dewar as being fairly common and Mr. A. S. Thyagaraju (*J.B.N.H.S.*, xxxvi, 752) has some very interesting notes on its occurrence there in large numbers from about the end of November 1923 to the end of January 1924. He did not however notice it in other years.

On the western side we have very little information. Hume states (*S.F.*, x, 343) that it certainly occurs on the lower slopes of the Nilgiris and this is confirmed by the fact that Col. H. R. Baker shot the female of a pair in a grassy swamp at Ootacamund on 31st December 1921 (*Birds of South India*, p. 208). This specimen is now in my collection. Kinloch says that it is 'very rare indeed' in the Nelliampathies, and Hume (*loc. cit.*) says that it occurs in the Palnis.

In Travancore there is one definite record (*S.F.*, iv, 372) when Bourdillon shot a female hawking at midday in bright sunshine at 4,000 ft. in the end of December. This presumably refers to the specimen in the British Museum collected by Bourdillon on 28 December 1875 in the Colathoorpolay Valley 3,000 ft., according to its label. Elwes, however, lists it for the Cardamum Hills (*Ibis* 1870, p. 527).

In some years the Short-eared Owl visits Ceylon in the months from November to February.

Strix indranee indranee Sykes.

Strix indranee Sykes, P.Z.S. 1932 (July 31), p. 82—Lonauli, W. Ghats.

Not obtained by the Survey. The Brown Wood-Owl is found in Coorg and the Wynaad according to Jerdon and, in the latter area, William Davison says that it is less common than in the Nilgiris where it is fairly well known. Kinloch (*J.B.N.H.S.*, xxx, 484) mentions a specimen procured in the Nelliampathies in February.

The Brown Wood-Owl does not occur in Ferguson's list of Travancore birds, but Stuart Baker (*Nidification*, iii, 502) says that it is found in that State from the lowest to the highest hills.

How far this owl extends to the eastern side of the Presidency must for the present remain doubtful. There is a specimen in the Madras Museum said to have come from the Shevaroys and far further north, Jerdon says that it has been sent from Goomsoor. If this is correct these north-eastern birds may well be closer to the Himalayan race.

Nothing is known accurately about the breeding season in the Presidency beyond the fact that a juvenile specimen from Ootacamund (William Davison) in the British Museum is dated 3rd May. The identification of the supposed Travancore eggs mentioned by Stuart Baker (*loc. cit*) is evidently quite unreliable.

A series of birds from Ceylon compared with Nilgiri birds are definitely darker in colouration both above and below. The white throat patch is virtually absent and the facial disk is richer in colouration with more chestnut tint. They may be separated as *Strix indranee ochrogenys* (Hume).[1]

This species is often credited—in my opinion wrongly—with being the so-called 'Devil-bird' of South India and Ceylon. It is not clear whether the cries heard at night in Ceylon and South India proceed from the same species, but the evidence as to their authors is very contradictory. See Legge, p. 158; *Stray Feathers*, ii, 342; iii, 332; vii, 253; *J.B.N.H.S.*, xxx, 484.

Strix ocellata (Lesson).

Syrnium ocellatum Lesson, Rev. Zool., October-November 1839, p. 289—Pondicherry.

Not procured by the Survey in spite of Jerdon's statement that he had found it most numerous in the Carnatic. The only definite records for the Mottled Wood-Owl in the eastern side of the Presidency are its inclusion in Dewar's list and the specimens in the Madras Museum labelled respectively Madras and Singaperumal Coil, Chingleput, to say nothing of the type locality Pondicherry.

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[1] *Syrnium ochrogenys* Hume, *Stray Feathers*, vol. i (1873), p. 431—Ceylon.

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On the western side William Davison was unable to include the species in his Nilgiri paper but Hume entered a note (*S.F.*, x, 343) that he knew of it on the southern base of the Nilgiris, north of the Collegal taluk.

In Travancore according to Ferguson the Mottled Wood-Owl is fairly common from Arukkutty to Vycome and he also mentions two specimens shot by his collectors at Perumbalam, an island in the Vembanad lake, in January 1903.

There is no reliable information about the breeding season in the Presidency.

This owl has no races in its limited range.

Ketupa zeylonensis leschenaulti (Temminck).

Strix leschenaulti Temm. & Lang., Planch. Col., pl. 20, livr, 4a (18 December 1824)—Chandranagore.

Specimen collected:—389 ♀ 12-6-29 Chitteri range 3,000 ft.

Measurements:—Bill 53.5, wing 392, tail 190, tarsus 71 mm.

There is a specimen of the Brown Fish-Owl in the Madras Museum from Covelong[1], a locality which I have been unable to locate precisely. With this exception the Survey specimen provides the only record for the eastern side.

In Travancore Ferguson says that it is common in forest land in the low country near the coast. Elwes also confirms (*Ibis* 1870, p. 527) that it is common in the lower valleys of the Cardamum Hills. In the Palnis Fairbank tells us that one was shot in the grove at Kodaikanal in April 1867 and that on his subsequent visit a pair were to be heard in the same locality every evening. Terry in his turn heard them in the same place.

Jerdon says that this Fish-Owl is not rare at Ootacamund and Primrose (*J.B.N.H.S.*, xvi, 163) confirms that it is common in the Nilgiris and adds that it is still commoner in the Wynaad.

Ferguson gives the breeding season in Travancore as March and April.

Ticehurst (*Ibis* 1923, p. 236 and *J.B.N.H.S.*, xxxiv, p. 473) has pointed out that in his opinion only one race of this species can be recognised in India, an opinion to which I have also independently arrived. Mr. Stuart Baker, however, recognises three races in India apart from the typical race in Ceylon. This last on our present material certainly seems recognisable on its darker colour and smaller size (wing 365-383 mm.).

Bubo bubo bengalensis (Franklin).

Otus bengalensis Franklin, P.Z.S. 1830-31 (October 25, 1831), p. 115—the Ganges between Calcutta and Benares and in the Vindhyan Hills between the latter place and Gurra Mundela.

Specimen collected:—462 ♀ 22-6-1929, Tirthamalai 1,000 ft.

Measurements:—Bill 44.5, wing 382, tail 194, tarsus 68 mm.

Jerdon says that there is not a rocky hill in the Carnatic where the Rock Horned-Owl is not to be seen, and it is interesting to record that the statement is still true today. Captain Bates has written to me 'I have never gone near any of the low bush-covered rocky hills so typical of the landscape immediately south of Madras without finding a pair of these fine owls inhabiting each hill'. There is nothing to show the further distribution on the eastern side of the Presidency beyond the above Survey specimen.

On the west it is only recorded from the Nilgiris, though here it appears to be rare. Jerdon says that he had killed it on the Nilgiris in dense woods. William Davison says that he had flushed it twice for certain, besides probably seeing it on other occasions. This statement is verified by a male in the British Museum killed by Davison at Ootacamund on 8 January 1887.

It will be noticed that the distribution of the Rock Horned-Owl is wrongly given in the *New Fauna* (iv, 415) and *Nidification* (iii, 511) as extending south only to Khandesh and the Deccan. This species is very variable in colour, exhibiting paler, more buffy and richer, more rufous phases. There also appears to be a slight increase of size from south to north throughout the Peninsula and Himalayas as pointed out by Mr. Stuart Baker, but I am of opinion that it is impossible to recognise more than one race in our area.

There is nothing on record about the breeding season in the Presidency.

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[1] Kovalam (Travancore)?—Eds.

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[**Bubo coromandus** (Latham).

Strix coromanda Latham, Index Orn., vol. i (1790), p. 53—Coromandel Coast.

According to Jerdon the Dusky Horned-Owl is found in the Carnatic in the more wooded parts and near hills, while Cardew is stated (*Birds of South India*, p. 213) to have obtained it at Ootacamund. This species appears to have been satisfactorily identified in Mysore (see Taylor, *S.F.*, x, 455). So the above records may be correct, but until further substantiation is forthcoming I feel that this bird cannot satisfactorily be admitted to the Presidency list.].

Huhua nipalensis nipalensis (Hodgson).

Bubo nipalensis Hodgson, Asiat. Res., vol. xix (after September 1836), p. 172—Nepal.

Specimen collected:—284 ♀ 25-5-29 Shevaroy Hills 4,000 ft.

Measurements:—Bill 51, wing 438, tail 225, tarsus 56 mm.

This specimen extends the known range of the Forest Eagle Owl which has hitherto only been known to occur in the Presidency on the western side.

In Coorg according to Betts it is widely distributed though nowhere numerous. In the Wynaad Primrose tells us that he twice was lucky enough to meet with it (*J.B.N.H.S.*, xvi, 163).

In the Nilgiris it occurs sparingly in the larger sholas, according to William Davison, being seldom seen except when the sholas are beaten for game, though Mr. Betts informs me that he has on occasion seen it perched on boulders or trees by the road at night. Major Phythian-Adams records (*Birds of S. India*, p. 214) that he shot four when beating sholas near Ootacamund in September 1927. Captain Bates informs me that he met with a young bird just able to fly on April 4 near Kotagiri.

In Travancore Ferguson considered it uncommon. He mentions receiving two live specimens which lived in captivity for some years, and that one was shot in the High Range (*J.B.N.H.S.*, xii, 203: xv, 667). Stewart evidently met with a good many nests in Travancore and found it breeding in December and January (*New Fauna*, iv, 418).

Sexed specimens are rare in collections, but seven birds from the Himalayas measure:—bill 54.5-59.5, wing 425-468, tail 213-242 mm. Ceylon birds are evidently smaller; three specimens in the British Museum measure:—bill 50.5-55.5, wing 370 (damaged) to 412, tail 184-215 mm. Their upper parts appear darker and the bars on the lower plumage are narrower and less numerous.

The single Survey specimen evidently belongs to the typical race, but I have seen no other specimen from Southern India, and until it is possible to settle whether Travancore birds agree with the Himalayan or the Cinghalese form it is impossible to settle the name for the latter. If they agree with Travancore birds the name *Huhua pectoralis* Jerdon, Madr. Jour. Lit. Sci., vol. x (1840), p. 89, pl. i (Malabar) is available. If, however, Travancore birds agree with the typical race the Ceylon bird will stand as *Huhua nipalensis blighi* Legge, Birds of Ceylon, pt. i (1878), p. 133 (Kandyan district, Ceylon).

The genus *Huhua* is separated from *Bubo* on the ground that the young has a perfectly distinct plumage from the adult. This is correct as regards *Huhua*, but it must be remembered that the juvenile plumage of *Bubo coromandus* is also different to that of the adult in colour and pattern. The difference may not be striking but it exists and it is problematical, therefore, whether the genus *Huhua* is worth maintaining merely on a question of degree.

Otus bakkamoena bakkamoena Pennant.

Otus bakkamoena Pennant, Indian Zoology, vol. i (1769), p. 3, pl. 3—Ceylon.

Not obtained by the Survey. There is very little accurate information about the Collared Scops-Owl in the Presidency but it must occur in the forests of the Eastern Ghats where Jerdon apparently obtained several specimens (Madras Jour. Lit. Sci. 1844, p. 120). Its occurrence at Ferahabad (over the boundary on the Ghats in Hyderabad territory) has been recorded (*J.B.N.H.S.*, xxxvii, p. 141) and it appears probable that these Eastern Ghats birds may not belong to the typical race.

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In Travancore it is said to be very common throughout the low country and foothills, occurring also up to 2,000 ft. (Ferguson, *J.B.N.H.S.*, xv, 667 and Bourdillon apud *Nidification*, iii, 516). There are two specimens in the British Museum from Trivandrum (Fry and Nair) and three from Mynall (Bourdillon). These last are mentioned in *Stray Feathers*, vii, p. 34 as having been reared from the nest.

In the Nilgiris it occurs up to about 4,000 ft. and where it occurs it is apparently common, according to William Davison, for every night its rather melancholy double metallic hoot is sure to be heard. Specimens from Coonoor (♀ 16-5-69 Carter) and Kotagherry (♀ 9-1-75 Cockburn) are in the British Museum. Primrose (*J.B.N.H.S.*, xvi, 163) suggests that it is still more common in the Wynaad while Jerdon seems to have obtained it near the Peria Pass (*Madras Jour. Lit. Sci.* 1839, p. 89).

Nine other specimens from 'Madras' and 'Malabar' in the British Museum merely confirm the above information.

The Collared Scops Owl is evidently resident and the breeding season is said to be in January and February (*Nidification*, iii, 516).

Otus sunia rufipennis (Sharpe).

Scops rufipennis Sharpe, Cat. Birds Brit. Mus., vol. ii (1875), p. 60—Madras, Eastern Ghats.

Not procured by the Survey. Although from the number of specimens in the British Museum—unfortunately without precise data—it is evident that the Indian Scops Owl is not uncommon in the Presidency there is very little precise information about it. Jerdon says (*Madras Jour. Lit. Sci.* 1844, p. 119) that the first specimen he saw was found dead at Madras and that he had since obtained it from the forests of the Eastern Ghats. Dewar gives it without comment in his Madras list, no doubt on the strength of the local specimen in the Madras Museum. Of the eight specimens (including the type) in the British Museum marked 'Madras' some appear to come from Madras itself. Mr. Daly is said to have taken eggs in the Shevaroys. (*Old Fauna*, iii, p. 294).

On the western side Hume received a pair from the Wynaad (*S.F.*, x, 343) and William Davison obtained a specimen on the 12th December at Segore which is in the British Museum together with a male collected by Miss Cockburn at Kotagherry on 3 November 1874. A female collected by R. H. Morgan in the Palghat Hills in April 1876 is also in the British Museum.

Three Anjengo specimens in the British Museum are all we know about the occurrence of the Indian Scops Owl in Travancore.

It is presumably a resident in the Presidency but there is no information about the breeding season. The rufous and grey phases appear to be equally common. I can find no information about the call note of this race but as both *Otus sunia sunia* (*Ibis* 1926, p. 752) and *Otus sunia leggei* Phillips, (*Ceylon Jour. Science*, xvii, 1933, p. 98) have the same call note, it seems safe to attribute it also to the present race. This is not as described in the *New Fauna* (iv, pp. 435-6) but may be expressed by the words *wukh-tuk-tah* or *wuck-chug-chug* uttered loudly enough to be heard several hundred yards away and repeated endlessly in a very regular and rhythmic manner, like the swinging of a giant pendulum or the working of a pump-engine.

Athene brama brama (Temminck).

Strix brama Temminck, Planch. Color. d'Ois. livr. xii (1823), pl. 68—Pondicherry.

Specimens collected: 51 ♀ 14-4-29 Kurumbapatti; 274 ♂ juv. 23-5-29 Shevaroy Hills 4,000 ft.; 687 ♂ 13-8-29 Palkonda Hills 500 ft.; 931 ♀ 19-10-29 Seschachalam Hills 2,000 ft.; 956 ♂ 1-11-29 Nallamalai range 2,000 ft.; 1302 ♀ 24-1-30 Godavery delta.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	19.5-20.5	147-152	67.5-69	25-26.5 mm.
3 ♀	20-20.5	151-160.5	69-78	29.5-31.5 mm.

There appears as yet to be no record of the Spotted Owlet in the north-eastern area of the Presidency above the Godavery delta, but southwards of the

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delta it appears to be generally common and there is no need to cite the records. A pair obtained on Rameswaram Island on 17 March 1873 at the close of Hume's trip to the Laccadives are in the British Museum.

On the western side there is less known about this owlet. In Travancore according to Ferguson it is very common in the low country especially about Cape Comorin where numbers may be found in the ruined fortifications of the old Travancore lines. Ferguson says that it does not ascend the hills but in *Nidification* (iii, 525) Stuart Baker says that it is found in the Travancore hills up to 1,000 ft. or 1,500 ft. Specimens from Chittoor (2-1-73 Dr. Day), Segore (♂ 19-2-81 William Davison) and Coorg (Tweedale Collection) are in the British Museum but William Davison's account (*S.F.*, x, 344) of the commonness of this owl in the plains (whether of Mysore or the Presidency is not made clear) suggests that these three isolated records do not give a true picture of the status of the bird in the west. This owl is of course a resident species.

Ferguson says that the breeding season in Travancore is in March and April.

The Spotted Owlet does not occur in Ceylon. There are only two races in India. The typical race is small and dark whereas *A. b. indica* of Northern India is larger and of a paler colouration. There is, of course, complete intergradation between the two forms, both in colour and size, and there is the further complication that individual birds may vary considerably in colour. A Punjab bird in Mr. Waie's collection, for instance, is as dark as any specimen from Travancore.

Accepting specimens from the following areas as truly representing the typical race, viz. from Rameswaram Island, Travancore, Biligirirangan Hills, S. Mysore, Salem District, the Palkonda Hills and the Seschachalam Hills—I find that it measures as follows:—

	Bill.	Wing.	Tail.
7 ♂	19-21	141-158	66-71.5 mm.
6 ♀	20-22	151-156.5	68-73.5 mm.

whereas a series *A. b. indica* from the Punjab measures:—

	Bill.	Wing.	Tail.
12 ♂	19-20	153-167	74.5-83 mm.
5 ♀	18.5-20.5	159-167	73.5-83.5 mm.

With these comparative measurements before me I find that practically all specimens up to the Tapti river agree in colour and a high proportion agree in measurement with the typical race. No precise boundary can be fixed between the two races because of their intergradation, but in view of the above I propose as a matter of convenience to recognise the 20° N. lat. as the dividing line. Mr. Stuart Baker's division at the 14° (*New Fauna*, iv, 439) is in my opinion certainly too far south.

Glaucidium radiatum radiatum (Tickell.).

Strix radiata Tickell, J.A.S.B., vol. ii (December 1833), p. 572—Borabhum.

No specimens of the Jungle Owlet were collected by the Survey and little is known about the typical race in the Presidency. Ball records it from Jeypore (*S.F.*, vii, 201).

In the Nilgiris according to William Davison the Jungle Owlet ascends the hills as high as Coonoor, being however more common on the lower slopes and at the foot of the hills. Primrose (*J.B.N.H.S.*, xvi, 164) records seeing it as high as 5,000 ft. in a shola near the Terramia T. E. Stragglers however go higher as a specimen in my own collection was shot by Col. H. R. Baker at Ootacamund. This bird, like specimens in the Hume Collection from Segore (♂ 22-8-21), Kullar (♂ 17-10-67, o? 16-9-69) and Kotagherry (♂ 26-11-74 Cockburn) all definitely belong to the typical race and not to the richly coloured *malabaricum*. The explanation doubtless is that in the Nilgiris, as Mr. Betts informs me, this owlet is not a bird of the western slopes but belongs to the drier facies. This species forms the subject of an interesting discussion by Vidal and Hume (*S.F.*, ix, 38-39) on the connection between depth of colouration and rainfall and it is a particularly interesting example in view of its status in Ceylon. In that island it is a bird of the dry region and in consequence

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Ceylonese examples agree with the typical race and not the Malabar form. This point was first made clear by Legge and is confirmed by a specimen in the British Museum. Unfortunately this interesting point is missed by the *New Fauna* (iv, 449) where Ceylon birds are attributed to *malabaricum*. The same paragraph contains a further mistake. Intermediate examples came from North Kanara and South Konkan not from Khandesh. There is a good series of Khandesh specimens in the British Museum and they are most typical *radiatum*.

Some examples of the typical race are much greyer than others, more particularly on the lower back and tail. This appears to have no connection with distribution but to be individual variation, no doubt representing the grey phase found in most owls.

The only record of the breeding season in the Presidency is furnished by *N. & E.*, iii, 112 when Mr. J. Darling Jnr. found a nest with two eggs at Coonoor on 12 March.

Glaucidium radiatum malabaricum (Blyth).

Athene malabaricus Blyth, J.A.S.B., vol. xv (1846), p. 280—Malabar Coast.

This race of the Jungle Owlet is confined to the western side of the Presidency and was therefore not met by the Survey. There are two specimens from Coorg in the Tweeddale collection in the British Museum and Colonel Sparrow has kindly lent me a male collected on 23 April 1912 at Malappuram. As Jerdon says, it also occurs in Cochin and Travancore and there is a good series from the latter state in the British Museum. Bourdillon and Ferguson tell us that it is common both in the low country and on the lower slopes of the hills in Travancore, sometimes ascending to 2,500 ft.

The breeding season in Travancore is said to be from March to May.

Ninox scutulata hirsuta Temm. & Lang.

Strix hirsuta Temm. & Lang., Planch. Color. d'Ois., livr, 49 (28 August 1824), pl. 289—Ceylon.

The Brown Hawk-Owl was not procured by the Survey and its distribution in the Presidency is not satisfactorily known.

In Travancore it is not uncommon in the hills in a zone between 2,000-3,000 ft. and is also said to occur in forest in the low country (Bourdillon and Ferguson). Three males from Mynall (Bourdillon) dated 3-12-1874, 24-2-1878 and 26-11-1879 are in the British Museum as well as two Anjengo specimens. This owl has not been recorded from the Nilgiris, but William Davison says that he heard it almost nightly in the Wynaad and the Brahmagherries, though he was unable to procure a specimen. There are however two birds from Coorg in the Tweeddale Collection.

The breeding season in Travancore is said to be from January to May (Bourdillon apud *Nidification*, iii, 536) and the bird is presumably resident.

I cannot separate birds from Ceylon and South India, and they appear to differ in size from the only Sumatran specimen which I have seen.

The Brown Hawk-Owl also occurs on the eastern side of the Presidency for Jerdon says that he met it in the Carnatic, and a specimen in the Madras Museum was apparently procured locally. There are moreover two birds in the British Museum labelled Madras, March 1877 and April 1876 (William Davison). These specimens appear to belong to the paler race *N. s. lugubris* which suggests that Madras here refers to the capital, and that eastern birds generally belong to that race which occurs as near as Raipur (Central Provinces). The point merits investigation.

Pandion haliaëtus haliaëtus (Linn).

Falco haliaëtus Linn., Syst. Nat., ed. x, vol. i (1758), p. 91—Sweden.

The Osprey is a cold weather visitor to the lakes near the Coast in Travancore according to Ferguson and at Madras Dewar says that some are to be seen fishing in most of the backwaters. The Osprey was not met by the Survey, and the only other record for the Presidency that I can trace is a

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female in the Hume Collection dated 1867. This appears to have been killed at a locality Thervoneedian which I am unable to find in any map.

Sarcogyps calvus (Scopoli).

Vultur calvus Scopoli, Del. Flor. et Faun. Insubr., vol. ii (1786), p. 85—No locality. Based on Sonnerat, Voyage aux Indes 1782, pl. 104, Vautour Royal de Pondicherry, and therefore now restricted to Pondicherry.

The King Vulture is, no doubt, generally distributed in small numbers throughout the Presidency as in the rest of India. LaPersonne reports it as seen by the Survey in the hills at Sankrametta and over the Shevaroys. Dewar includes it in his Madras list and Captain Bates gives me details of a nest found in a tope near St. Thomas' Mount on May 31st. On that date it contained a young bird which was still in the nest at the very end of June.

In the Wynaad and the Nilgiris it is not common, according to William Davison; and there appears to be some doubt regarding Primrose's note (*J.B.N.H.S.*, xvi, 164) on it in these areas, as he writes of it as breeding on the precipices, a habit that has never been confirmed.

For the Palnis Fairbank says that he observed it rarely at the base of the hills, while Terry says that he used to see one and very often a pair almost every day near his camp at Pulungi. A well-marked egg was taken by Howard Campbell at Kodaikanal (Stuart Baker, *Nidification*, iv, 7).

Ferguson received a live specimen from Colasagram, a locality close to the hills in South Travancore.

Gyps indicus indicus (Scopoli).

Vultur indicus Scopoli, Del. Flor. et Faun. Insubr., vol. ii (1786), p. 85—No locality. Based on Sonnerat, Voyage aux Indes, vol. ii (1785), pl. 105, Le grand Vautour des Indes. Now restricted to Pondicherry.

The Indian Long-billed Vulture is best known from the western side of the Presidency where it is found in small numbers through the Wynaad and the Nilgiris. It also occurs in the Palnis where Fairbank met it rarely at the base of the hills and Terry saw several at a carcase at Kukal. It seems to be scarce in Travancore as Ferguson merely mentions a live specimen brought in from Nagercoil.

This vulture breeds in the Nilgiris and also in the Shevaroys and from the latter hills there is a good description of two small breeding colonies examined by Packard (apud Stuart Baker, *Nidification*, iv. 11). A specimen from St. Thomas' Mount is in the Madras Museum.

The breeding season is said to be in December and January, but Stuart Baker mentions eggs taken as late as 3 March in the Nilgiris.

Pseudogyps bengalensis (Gmelin).

Vultur bengalensis Gmelin, Syst. Nat., vol. i (1788), p. 245—Bengal.

In the west of the Presidency the White-backed Vulture is the most common species, in Coorg, the Wynaad and the Nilgiris, appearing in hundreds at a carcase. In the Nelliampathies it only comes up from the plains as a temporary visitor, roosting there if gorged, according to Kinloch. There is no record for the Palnis, but in Travancore it is found throughout both the low country and the hills. Ferguson says that there used to be a breeding colony in a patch of forest near Oliver's Estate in the Ashambo Hills but this was destroyed in a clearance for coffee cultivation.

The only record for the eastern side of the Presidency is Dewar's inclusion of the name without comment in his Madras list.

Ferguson says that the breeding season in Travancore is from February to April.

Neophron percnopterus ginginianus (Latham).

Vultur ginginianus Latham, Index Orn., vol. i (1790), p. 7—Gingee, Coromandel Coast.

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The Neophron appears to be somewhat irregularly distributed in the Presidency, and this fact will probably be found to have some connection with the distribution of rainfall. In Coorg, Betts only saw a single specimen, on 26 February 1929. In the Wynaad it is more common and over the slopes and plateau of the Nilgiris it is abundant, especially about Ootacâmund, Kotagiri and the various Badaga villages, though it is seldom seen on the uninhabited western side of the plateau—as one would expect. Fischer has an interesting note (*J.B.N.H.S.*, xvii, 525) of six feeding on a hatch of termites at Geddisal, Coimbatore.

In the Nelliampathies it is scarce, Kinloch merely recording a single bird in some cooly lines on March 20. It is more common on the slopes of the Palnis up to 5,000 ft., occurring also occasionally up to the summits.

In Travancore it is common in the dry area of the extreme south about Nagercoil, but absent from the rest of the State.

On the eastern side there is very little information. The Survey reported a single bird on the Chitteri plateau. Captain Bates informs me that he took a hardset egg from a nest on the spire of the Garrison Church at St. Thomas' Mount on 14 March 1924, the birds building another nest and laying again when that was taken. In 1929 there was a nest in the same place with a large chick in July. Similarly Dewar says that there had been a nest for twenty years or more on the steeple of the Scotch Kirk at Madras.

A specimen from Kodambakam is in the Madras Museum.

(*To be continued*).

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EARLY DAYS IN MALAYA.

BY

H. E. Burgess.

Malaya was a comparatively new country when I first went out there in the year 1900. It was only twenty-six years earlier—1874—that the British Government in Singapore became interested in its development, and at that time very little of the country had been explored. The three ports, Singapore, Penang and Malacca had come into our possession several decades earlier, but the Malay States which comprise all that part of the peninsula south of Siam, was for the most part virgin jungle. The construction of roads and railways had commenced at various centres, and a few miles of railway had already been opened for traffic, but the chief means of transport was by small boats on the rivers, where at scattered intervals along the banks, small villages were met with. Only small areas near by the villages were under cultivation which for the most part consisted of coconuts and areca-nut palms. The centres where construction works had begun were the places of residence of the rulers of the four important states, and these had been made the headquarters of the four Governments, each under the control of a British Resident.

Hospitals, Courts and Police stations had been established, and the designs of these and other public buildings were of imposing structure, and significant as pointing to the future prosperity of the country.

It was noticeable that the small townships were being extended on a proper basis. No haphazard methods of building were permitted, while streets and water services were laid out on modern lines, and the result to-day is that, in a country which is notoriously unhealthy the towns themselves are as free from malaria and other tropical diseases as any of the larger towns in England.

At the time I speak of it was only these small towns which could boast any form of civilization and, except for the clearings near villages, all else consisted of jungle, unpopulated and infested with wild beasts. Certain areas had been opened up for tin mining, and some planters over from Ceylon had commenced to grow coffee, but in neither case were these areas extensive.

For the first ten years of my career out there I lived in the heart of the jungle, engaged at first in surveys and construction works, and later on in opening up large areas of land for rubber cultivation. Under such conditions it was only to be expected that I had ample opportunities of seeing wild life and being able to indulge in some big game shooting. My regret is that I did not take up the study of Natural History as I ought to have done, and for this reason I am afraid my notes will not be of much value from a scientific point of view. They are written at the instance

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of a friend who has suggested that a comparison with conditions in India would interest readers of this journal. Unfortunately, my knowledge of India is confined to the Nilgiri hills of the Madras province, where on the plateau the pine and rhododendron woods are non-tropical, and the scrub jungle at the foot hills does not compare with the immense trees and heavy undergrowth typical of Malayan forests. I have no doubt however, that such growth is found in the moist climates of Malabar and Travancore, and that the larger beasts of the jungle, and especially the greater carnivora, have the same characteristics.

I did a fair amount of shooting but was not bitten with the lust to kill, and I did not shoot with the idea of obtaining records. I was never keen to get an elephant, and after I had bagged my first two or three tigers and a few panthers. I did not go out after them unless I was appealed to by the villagers who were losing cattle and goats.

Before relating my experiences I must mention that certain birds and beasts of India are not found in Malaya. There are no vultures and no kites, and there are neither hyenas nor jackals. I was on the point of saying there were no crows, but recollect seeing some occasionally. I have seen only the jungle crow and these birds are never seen in towns and villages. The common song birds of the Nilgiris such as the thrush, the bulbul, and the blackbird, are either not found there or are very rare; and owing no doubt to the absence of tanks there is no duck shooting to be had. I never saw a wild duck and only once came across a few teal.

Tiger (Malay: *Harimau*).

My first district in Malaya, thirty-six years ago, was good tiger country. It was also recognized as the most unhealthy district on the map. I shot more tigers than any other European out there, and my bag was only thirteen. The only person who had got more than this number was the Sultan of Johore. I am speaking of fifteen years ago when we were able to compare notes. The Sultan had shot about twenty. Very few men have got as many as three or four, and several sportsmen who have bison and elephant to their credit have never shot a tiger.

When compared with the enormous bags obtained by many shikaris in India the numbers sound absurdly small, but I do not think it means that tigers there are comparatively less common. I am positive that as the country gets more opened up, more tigers will be seen. At present only about one-tenth of the land has been cleared of jungle, and the jungle itself is too big to permit of driving being done with success, and too dense for stalking. It is only in jungle of secondary growth that one has a chance.

Rewards are paid by Government for every dead tiger brought in to a Police station, and the majority of rewards are paid to Malays who, more often than not, get their tigers by the setting of spring guns. I had observed up to about ten years ago that the greatest number brought in for one year was ninety-six, and

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a comparison with India might be made by reckoning the respective areas of the two countries.

The general opinion among sportsmen in India is that the Malayan tiger is a smaller animal than his Indian cousin, but I am convinced this is not the case. I can vouch to shooting one which measured 9 ft. 8 in. between pegs, and although this was exceptional, one other measured 9 ft. 3 in. and another 9 ft. 0 in. All that I got were well conditioned and massive beasts, and of the forty or fifty trophies I have seen in India, and the half dozen or so I have seen killed on the Nilgiris, not one has compared with my big one, and all were much of an average with the full grown tiger of Malaya. There is one tiger at the Mysore Zoo which looks as heavy as my biggest, and it may possibly measure as much or more in length. I saw it from a distance in the parked enclosure and had not the best means to judge, but it certainly looked a very big one. The Commissioner of Police Perak—(Mr. Willes Douglas) who saw my big tiger interested himself afterwards in obtaining measurements, and some years later he wrote and told me that the next best taped only 9 ft. 4 in. (*N.B.* This was the Bukit Gantang man-eater referred to later on.) I may mention that all my big tigers, and the man-eater above mentioned, were shot in the one district in Perak. Of those I shot in Johore and Negri Sembilan none measured more than 8 ft. 8 in.

I have never done any shooting at night, and the majority of my tigers and panthers have been bagged between 11 a.m. and 6 p.m. I had a few thrilling experiences which I shall record in detail, and meanwhile will describe the methods I generally employed and which proved so successful. When a kill was located no one was permitted to approach nearer than twenty feet or so. A tree near by was selected, and on this tree a few planks were lashed together to form a seat. No elaborate machan was erected, and noise and other disturbances were practically nil. My five or six men were then told to go off about a quarter of a mile away. They were to keep together, moving more or less in a circle and at the same distance from the spot. They were to talk to one another all the time but were not to make a din, no shouting and beating of tins being permitted, and it was seldom I had to wait long before the tiger turned up to see that his kill had not been disturbed. The District Officer at Tampin, whose name I have unfortunately forgotten, mentioned to me that he had sat up a dozen times for a certain tiger which he had never even set eyes on, so I told him what I used to do and a few days after this I had a telegram from him to say he had bagged his tiger. I must not omit to say that I invariably built the platform at not less than twenty feet from the ground. My reasons for this were not for the sake of safety but because I felt it would minimise the chance of being detected by the tiger. It is probable that many a tiger has been lost for lack of this precaution.

My rifle, an H.V. 450-500 by E. M. Reilly, was a wonderfully accurate and hard hitting weapon, and usually I did not require

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to spend more than the one cartridge on a tiger or panther. I had put in a good deal of target practice and could invariably tell where my bullet had struck, and my proud boast was that I had never lost an animal which I had fired at. On one occasion I had an easy shot at twenty yards at a tiger immediately below me and I was surprised to see it bound off. I thought I had hit him right in the middle of the head. I was perfectly certain he was badly hit so I followed up immediately and came up to him walking ahead in a very dazed state when a second easy shot brought him to book. My rifle was not blamed for the slight error in the first shot as I realized I had taken a dose of quinine to ward off fever and that this had rather shaken my nerves.

My first tiger was got quite by chance. A friend and I strolled out one afternoon with our rifles hoping for a shot at a deer or wild pig, and we had not gone far when we came on to the tracks of a tiger which had crossed a bit of new road, where in the soft mud his pug marks showed him to be on the big side. I went a little way into the scrub to see where he had gone and suddenly to my horror I saw two full grown monsters facing me not twenty yards away. One was standing up, but the nearer one was crouching and looked the more dangerous of the two. There was not much time for thought, and firing quickly I dropped this one dead with a bullet through the brain. The other bounded away to the side with a tremendous roar, and when I turned round I found my friend in a terrible state of nerves. He had stopped behind to light his pipe and did not see me lift my rifle to shoot, and the sudden report and the roar of the tigress upset him very considerably. I discovered next day that the tigers had killed a big boar which at the time was behind us. We had evidently disturbed one and met them as they were both returning.

With the exception of two other exciting incidents which I shall relate, all my tigers were got by methods already mentioned.

One afternoon a Railway overseer came to tell me that he had seen a tiger prowling about near his house. He kept some goats in a shed, and the tiger had approached very near to this, but it moved away when it saw the man as he ran off to call me. I had one of his goats tied up on the edge of the jungle while I hid myself in an adjacent clump of sago palms. It was then about 5 p.m. and, as the tiger had not shewed up at dusk, I decided not to wait and called up my men. We started homewards through a rice field, a man with a lantern leading. I followed next and the man leading the goat came last. All went well for the first few yards when suddenly the tiger ran out with a roar and seized the goat. In the confusion that followed both my men fell and the lantern went out, and the best I could do in the circumstances was to fire a shot in the air. None of us saw the tiger and no one was hurt except for one man whose wrist was bruised by the rope attached to the goat and which was partly twisted round his wrist. When I went to investigate next morning I found the goat dead with its back broken, but otherwise untouched. I also came across the tracks of a tigress and two cubs.

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I was living once in a small house close to the jungle and one morning there was great commotion which I guessed to be a fight between a tiger and a wild boar. There was no mistaking the sounds and my servants, very foolishly I thought, ran towards the spot and surprisingly managed to frighten the tiger away from the boar which he had just killed. I sent them back at once and took up a safe position in the leafy branches of a tree—in this case not more than about six feet from the ground. In five minutes the tiger was back, but instead of approaching the kill directly he went off at an angle. Not knowing what his intentions might be I risked a long shot and got in a smack behind the ear. He disappeared down a ravine and for the moment I thought I had lost him, but when I called out to the servants I heard him groan only a few yards away, and when we found him he was dead. He was a small beast, not quite full grown, and the boar also was on the small side.

A full grown tiger can kill the biggest of Malay buffaloes and I was curious to know what chance he would have against a bull bison. The following story provides proof to a certain point only. The bison killed the tiger, but the latter was rather an emaciated beast and had a festering wound in its shoulder. I was going down river once when I met a Japanese photographer coming up stream with a dead tiger on his boat. He said he had shot it and he produced a ·32 revolver as proof. The wound in the tiger's side looked as though a small cannon might have been used, and as the circumstances called for investigation, I prevailed on the gentleman to return with me to the spot. An inspection of the ground shewed that there had been a big fight between the tiger and a bison; and the bison although he had lost a lot of blood, apparently lived to fight another day, as we did not come up with him.

It must be very seldom that any one has witnessed a fight between a tiger and a wild boar, but it was my good fortune once to see such a fight from start to finish. I was being poled up the river Muar, and just as we were rounding a bend we spied a big boar crossing a sand spit on his way to drink. My boatmen quickly allowed the boat to drift into a clump of tall rushes where we were fairly well concealed, and as I was putting my rifle together I saw the boar suddenly turn round and face the jungle, and in the next instant a tiger walked out. It is difficult to describe what happened next—so quick were the movements on the part of both animals. They both charged and it looked as though they must meet with great force; but such speed was displayed in leaps and side steps that the result, in what seemed a second of time, was that they were facing one another again twenty feet apart, and the boar still with his back to the river. The same movements were repeated three or four times but I think the tiger must have done damage each time as the boar appeared to be weakening. The end came when the boar made a rush. With one movement the tiger side stepped and leapt on its back and was dragged like this into the jungle, where shortly the dying gasps of the pig told me that all was over. The sun had gone

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down and it was beginning to get dark, but thinking I might get in a chance shot I ran the boat in and stepped ashore. The tiger however was on his kill only a few yards inside the jungle, and the angry snarls he was making told us it would not be safe to approach any closer. My boatmen were shouting to me to get back into the boat and it was a great relief to all of us when we pushed off into mid-stream.

I shall conclude my notes on tigers with the story of the Bukit Gantang man-eater, but before proceeding to this I must tell of my one and only mishap in the Malayan jungles. I had arranged a drive through an area of scrub where it was known that a tiger used to lie up occasionally. No recent tracks had been seen, and it was purely speculative whether I would come across anything bigger than a pig. There were no big trees in the scrub and I had to take up a position all alone behind a small ant heap—the beaters knowing exactly where the position would be. After about half an hour, as they were coming towards me, I detected what I thought was the stealthy tread of a tiger at my back, and turning round I saw what I thought was unmistakably a tiger coming at me. I fired, and it was fortunate that for the first time my rifle did not kill. I had shot a man who had lost his way in the beat and was making his way back on all fours through heavy thorny scrub. I was congratulating myself on having got another tiger when almost immediately I heard a cry 'You have shot me, Sir'. As I have said, the man was down on all fours and facing me, and the bullet went under his chin, between his arms, and slightly grazing the stomach, entered the groin. He was rushed off to hospital and underwent a successful operation, but it was nearly a year before he was able to walk. Mr. Babo, the man in question, was a Malay of good family, and a thorough sportsman. At one time in hospital he was thought to be dying, and in the deposition he made he exonerated me from all blame, admitting that it was his own fault for coming behind me; and when after a year he was well enough to attend court on a summons to give evidence in the case the Police brought against me, he made the same statement. He was one of the last to call to bid me good-bye when I was leaving the country.

The Man-Eater of Bukit Gantang.

I was always told that a tiger takes to killing men only after it has grown old and is too feeble to catch fleeter and stronger game. This particular tiger was a fine beast and by no means past his prime. Surely a man-eating tigress must bring up her cubs on human flesh, and would not these cubs grow up to be man-eaters themselves? Certainly they would. The Bukit Gantang tiger acquired his delicate taste by accident. A Chinaman had two pigs which he kept in his bed-room. One night the tiger broke in and went off with the bigger one. The man not wanting to lose the other fenced it in under his bed, but the fence was a strong one and some nights afterwards the tiger being

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unable to break it down, went off with the man. I know this for a fact, and I also know that about a dozen men were taken in the next two months. It was due to a careless Chinaman that this tiger took to man-eating and I recollect how another careless Chinaman had a narrow escape from the same tiger. Every one knew about the man-eater and all the railway coolies had gone home except this one man. I was walking along the railway embankment when I came upon the tiger's tracks. There had just been a heavy shower of rain and he had gone by after the rain, which meant that he was only just ahead of me. Following up quickly I came on to this solitary old man breaking stone where a minute or two before the tiger had passed within ten feet or so. To my surprise the old man said he had not seen the tiger, but after I had gone on some distance he called me back and asked if I had meant a large yellow animal with black stripes, and if so he was sure now that he had seen it! I remember one other escape. A man was carrying a sack of pepper when the tiger sprang and went off with the sack instead of the man. Mr. Donaldson, District Officer, Matang, followed up and found the sack torn to shreds. I understand the man received so great a shock to his nerves that he would not venture outside his house for many months afterwards.

One exciting experience I recall very vividly. Early one morning while I was dressing upstairs I heard what sounded like a scuffle in a carpenter's shed near the bungalow, and on going down to see what it was all about, I saw that something very serious had happened. A bench and a table had been overturned and there was blood all over the place. My first thought was that murder had been done, but a tell-tale pug mark in the saw dust gave the tiger away, and within a few minutes two police men and I were hot on his tracks. The man had been dragged about half a mile up a water course, and as we approached we heard the tiger move away. When we found the body, only a small part of the thigh had been eaten, and as the tiger made no attempt to attack us I knew that nothing more could be done. Having shed man's blood he was afraid and would not return. It requires little imagination to realize what a feeling of dread pervaded the village, where it might be said death lurked behind every bush. Cattle and goats were penned by four o'clock in the afternoon, and the Malays and Chinese had to shut themselves up in their houses long before it was dark. I never ventured out without my rifle, and took good care not to get too near the jungle. It was a strange thing that this tiger frequently gave vocal notice of his intended visit to the village. He would call from about a mile away and repeat this at intervals till he got quite near, when there was a silence which was really ominous and oppressive. Excitement was intense as it was not known near which house the dread monster was looking for his next meal; and I imagine there must have been many sleepless nights in houses so flimsy of structure that one blow of the paw could have smashed in the thin plank walls. Some people were no doubt late in shutting up for the night, while gangs of coolies used to turn out

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to go to their work in the early hours of the morning almost before it was light, and the wonder to me is that the number taken was so few.

I was due for home leave and my passage had been booked for a date not far ahead, and it can be imagined how keen I was to get him before I left, and what trouble I went to in the matter, and yet success did not come to me. I had learnt fairly accurately the line he would take on his way down from the hills to the village, and I actually saw him twice without being able to get in a shot, and I had to leave with the feeling that if I could have possibly delayed my departure for a few days I should have brought him to book. He was killed very shortly afterwards by my own shikari who admitted to having set a spring gun on the tracks he had learnt when on his expeditions with me. The setting of a spring gun is an offence liable to severe punishment but in this case, not only was the man let off, but he was given the reward which had been raised to two hundred dollars. The tiger was a male in splendid condition, and, as I have stated, measured 9 ft. 4 in.

Panther (Malay: *Rimau kumbang*).

It is recognized that the spotted panther and the black panther are one and the same beast, the colouring of the latter being due to melanism. This being so it is strange that all panthers in Malaya are black. Certainly all that I have seen, whether in Perak in the north or Johore in the south, have been black ones. They are not easy to get, and I do not think any one else shot as many as the five that I did. They do not frequent the neighbourhood of towns and villages as in the case in India, and it is more commonly the tiger that does this in search of goats and dogs, which are quite a favourite food of his. I know that in India it is usually the panther which accounts for dogs, and that tigers are very rarely to blame, but in Malaya many a good dog has been taken by a tiger. I have many proofs of this; and in one planting district where in a radius of ten miles quite a number of dogs had been lost, none were taken after a tiger had been shot over a dog as bait. A husband and wife (Mr. and Mrs. Fenner) had their fox terrier snatched from almost under their feet by a big tiger. The Malay panther is a small animal, seldom measuring more than 6 ft. 6 in. Having shot so few I can recall all five incidents and in only one of these did I have exciting sport. I was using a theodolite on a hill top overlooking an extensive rice field when I happened to spot two animals crossing from big jungle to a small patch of scrub in the field, and bringing the telescope to bear on them I saw they were panthers. A large gang of men quickly surrounded the patch and we then commenced a drive. One broke very soon at full speed into the open, and I was able to bowl him over with one shot. We did not see the other and I am still at a loss to know how it escaped. The patch of scrub was quite small, and although we combed it pretty thoroughly the beast did not come out.

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Wild Dog (Malay: *Angin hutan*).

I do not think that any of the Malays in the four districts I lived in were aware that wild dogs existed in their country. On the other hand it may be common in districts I do not know. I came across one only in the Larut district in Perak, and this one I shot and presented to the museum. There was already one specimen in the museum which I know to be the wild dog of India, but the one I shot was smaller, not so red, and without the black points. The difference in colour, size, and marking was perhaps due to the fact that it was not fully grown. A Malay found one of his goats one morning killed and partly eaten by what he described as some mysterious animal. There were several bites on the side and the entrails of the goat had been torn out, and further, no attempt had been made to drag it into the jungle. It was left just where it had been killed, in a patch of grass land. The Malay suggested either a tiger or a panther cub, but to me it looked more like the action of a wolf or a wild dog, and thinking that neither of these animals existed in the country I was completely nonplussed and all the more determined to know what it was. The kill had been made some time between nine and ten o'clock in the morning, and as I had no pressing work on hand I prepared to wait till nightfall if necessary. At two o'clock in the afternoon the dog came out, and when I saw there were no more to follow I shot him just as he commenced to feed.

Elephant (Malay: *Gajah*).

Elephants roam all over the peninsula and are common as far south as Johore. Unlike the elephant of Ceylon the male has tusks of fair size, and the tusks of one monster which charged and derailed a ballast train in Perak and was himself killed in the encounter, are certainly very big. They are in the museum in Taiping and I think are not far short of the measurements of the tusks secured by Major Gillespie five or six years ago in the Billigirirangan hills of Mysore.

With this exception, I have not seen any measuring more than 40 in., but since only a small fraction of the jungle has yet been cleared, the probabilities are that large herds have not been seen and that these herds contain specimens worth looking for.

I have mentioned that I had no desire to shoot an elephant, but I was much tempted to do so once when, at ten o'clock one morning, one of my assistants and I saw a big tusker walking through a field of rubber. The mere fact that he had tramped over half a mile of an area of young plants seemed sufficient justification for his being shot, as we felt that considerable damage must have been done, and snatching up our rifles we were soon in hot pursuit. Following up his tracks we were surprised to find that not even one plant had been crushed, but notwithstanding this our excitement carried us on, and presently we cornered him at a bend of a river which was in full flood. He saw us, but did not seem a bit concerned and, as the desire to kill had passed, I decided to turn round and make for home. We had

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actually gone back some distance when my friend J. B. thought it as well to have a pot at him to frighten him off, and he went back for this purpose. Presently I heard a shot and this was followed immediately by the sight of the young man with the elephant in close pursuit. They were in a patch of tall grass when J. B. suddenly disappeared and the elephant trotted over the spot where I had last sighted him. Luckily J. B. had fallen into a trench which the elephant stepped over, and he is still alive to tell the story, which is seldom believed! Small blame to the listeners, but J. B. is a truthful man and so am I. It appears that the elephant had charged before the shot was fired, and the probability is that the bullet went wide.

My Malay shikari told me that herds moved from one feeding ground to another at more or less regular monthly intervals, but not only was he not able to prove this but he shewed himself to be entirely wrong. For regularity in his habits however, I have not known any animal to beat a certain solitary bull whose return to the same spot every month was expected within a day or two. The villagers were always ready to receive him with crackers, and although he was frightened away each time, back again he came next month to meet with the same reception. He carried out this programme for many months, and perhaps for many years. It would have been an easy matter to kill him but I did not try, nor did I let on about his habits to others who might have been keen. I examined the spot on two occasions on the morning after the appointed day, and true enough I saw his tracks. I saw him two or three times at various other spots and had begun to look on him as an old friend. He did no damage on my property and never molested the coolies, but on one occasion he annoyed me very much when he walked along a new road trace and pulled up all the centre line pegs which I had put in at a good deal of personal trouble.

A Railway surveyor who had set out five miles of line woke up one morning to find all the important pegs gone. Pegs were put in at every chain, and at every tenth chain was a larger peg on which the true centre had been marked, and it was these pegs only which had been torn out and flung aside. The ordinary chain pegs were painted black, while the tenth peg was a white one.

My Chinese coolies who had evidently not previously seen an elephant did reverence to this one. When visiting their lines one morning I found the whole gang with their heads bowed to the ground and they told me that God had just gone by. The elephant had passed quite close to them and the tracks shewed that he had moved by quite slowly.

Rhinoceros.

In all my thirty years in Malaya I knew of only two rhinoceros being killed. The one-horned rhinoceros (*R. sondaicus*) is very rare in that country and I believe that only three specimens have been obtained. One of these was shot by the late Mr. H. C. Barnard, in whose house in Taiping I saw the foot which he had

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mounted as an umbrella stand, and I recollect his telling me at the time (1901 or 1902) what a rare animal it was, and what difficulty he had in getting it. The two-horned animal (*R. sumatrensis*) is more common but I did not see any. In recent years one of these was shot by the Sultan of Johore, and, I was told, about that time, that another had been killed by an assistant on a rubber estate who got into trouble about it. H. H. The Sultan is very jealous as regards the protection of animals in his own jungles, and great credit is due to him for instituting game laws in his State, even before development of the country had begun. No enactments were passed and no licenses are issued, shooting being permitted only on permit signed by the Sultan himself. His example was slow to be followed in the four Federated States, but the appointment of a Game Warden was made about twelve years ago, and during the current year (1935) two thousand square miles of jungle have been defined as a game sanctuary.

The Gaur (Malay: *Seladang*).

In Malaya, the Gaur or Indian bison goes by the name *Seladang*. It is the same beast and quite as big.

I shot two, both solitary bulls and both good specimens, but neither approaching the record.

Among Europeans, T. R. Hubback has shot more bison and elephant than any one else, and satiety being reached, he is probably the best man for the job of Game Warden which he now fills with much ability.

I had been some years in those parts before I was stationed in bison country, and it was a year or two after this that I was able to select my first. The game was new to me and I was much surprised to learn from men who had shot a number, that bison was the easiest to obtain of all the big beasts of the jungle, and I discovered that this was quite true if one wanted to shoot by the methods recommended. They come out to feed at night in grass country and it is quite an easy matter to intercept them in the morning on their way back to the jungle. This method did not appeal to me, and I am afraid I annoyed my tracker very much when, on the two occasions he had taken me out, I allowed some fine bulls to pass within sixty yards or so. I preferred to try stalking. With the promise of a reward as compensation for his two disappointments, my man did his best and shortly put me on to the tracks of a big solitary bull which had finished feeding and had moved off into the jungle. This was really exciting, and I pride myself that I managed to get the beast. The bison had been given time to enter the jungle before we arrived at the feeding ground and, as it had rained overnight, we were able to tell that he was not more than a quarter of an hour ahead. He had moved into jungle which almost baffles description, so intertwined was it with thorny creepers, that our only means of progress was along the tunnelled passage the bison had made.

I knew that it was a belt of only a few yards width and that we should presently come into more open scrub; but I also knew

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that although the going would be easier tracking might be more difficult for the reason that the bison might still be feeding and was likely to meander and so face us at any time. It took us about ten minutes to negotiate the narrow twenty yard belt, and, before we emerged, we carefully prospected the land ahead. It must not be imagined that the view was an extensive one, since although at the start we could see only three yards, we could now spot our beast up to perhaps twenty yards but certainly no further.

My Malay was down on his hands and knees. I was a yard behind moving one step at a time. While shaking like a leaf, I could not help thinking that I was a fool to take the risk. I prayed for a broadside shot, or a shot as he was moving off; but I dreaded facing him. While pondering these thoughts, I saw my man lie flat and point to something on the left. I could distinguish nothing, but presently knew that it was sound and not sight that raised the accusing finger, and that the noise was of the great beast chewing the cud. My man, I noticed, turned his head to the right, and instinct told me he was looking for a safe tree or log behind which to hide, and the probability is that the movement was noticed by the bison, as in the next instant he jumped up with a snort and stood directly facing me.

Another second and he might have turned round and bolted, or he might have charged and reached me, but within the second I fired and my bullet, which entered the throat just above the dewlap, caused him to crumple up only a yard nearer to me. My second shot was fired while he was struggling on the ground, and before he had made his last kick my Malay was cutting his throat. I must admit that all the time we were following up my nerves were on edge, but I seemed to be perfectly steady the moment I saw the bison. While tracking, I thought of my own personal danger only, but seeing the Malay had not flinched I felt he had shewn a hundred times more pluck than I had. His only weapon was a long jungle knife. In this hunt we had covered less than half a mile and it had taken us a full hour to do it. The distance paced between the dead bull and the spot where I was standing measured less than forty feet.

There is only one case on record in Malaya of a European having been killed by a bison. This was Capt. Syers, the Commissioner of Police. He had wounded a bison with his big bore, black powder rifle, and his second barrel was not sufficient to stop the beast when it charged. The bison's head is on view in the Selangor club, Kuala Lumpur.

Serow (Malay: *Kambin grun*).

On certain limestone hills in Perak and Selangor there exists a type of wild goat, which although it may be fairly common, is very rarely seen. It happened that my first station was not far from one of these hills, and I was told that these goats were to be found there. The Malays call it the *Kambin grun* and it has been identified as the 'Serow'. I was also told that only one had been shot, and that Sir Frank Swettenham was the sports-

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man who got it. The hill that I speak of (Gunong Pondok) was of peculiar formation, rising as it did almost sheer from flat padi land to a height of over a thousand feet. There was next to no foothold on its steep sides, and I admit to defeat at my one and only attempt to gain the top.

I was anxious to see one of these animals, and, as my attempt to climb had failed, I looked to see what a telescope could do, and one day I actually did see one and one only. I saw it moving about for quite a long while, but it was more than half a mile away.

Sambhar (Malay: *Rusa*).

The biggest of stags carries no trophy worth keeping. I had to shoot a fair number because of the damage they did to young rubber, and not one of these carried antlers measuring more than twenty-seven inches.

Wild Pig (Malay: *Babi hutan*).

I have had very few opportunities of reading the Society's *Journal* and have not read anything about the wild pig, but I quite realize that much must have been already written about it, and that any new notes are likely to be put aside as being on a subject too common to be of interest. I have reasons, however, to write at some length about this because I have not been able to identify the particular '*Sus*' which has interested me. The common wild boar of India (*Sus cristatus*) is found all through Malaya, but there is another species which I have seen only twice. Its colour, shape, and habits are all distinct. Comparisons which I may possibly make very crudely will none the less be descriptive, and I enumerate these as follows:

1. The common Indian Wild Boar is of massive build, is black in colour, and is high at the shoulder. The other pig is smaller, and lightish brown in colour. It has a longer snout and the rise at the shoulder is not so pronounced.

2. The common pig moves about in small herds. On the two occasions I saw the second species they passed through the rubber estate in a herd over one hundred strong.

3. The common pig usually feeds at night. The others came out once at eleven o'clock in the morning, and on the second occasion at two in the afternoon.

4. The common pig seldom did damage on an estate, contenting itself with feeding on rubber seed which had fallen to the ground. The two herds mentioned did considerable damage to the roots of the trees in the short time they took to pass through the estate.

5. The common pig is very seldom killed owing to its cunning and nocturnal habits, and it must be very seldom indeed that it is killed by coolies who don't possess firearms.

On the occasions I speak of, Tamil coolies belonging to the estate were able to despatch with knives and sticks, about four or five in the first instance, and no less than eight the second

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time. Both herds were seen on the same rubber estate at a small place called Genuang, in Johore, and if I remember rightly, the first time was in 1911 and the second time in 1913.

Unfortunately, because of my lack of interest in Natural History at that time, I did not record details of a specimen which I felt then was out of the common. The species has since been identified as *Sus barbatus*. It was first recorded from Pahang in 1918 and reported on again, also in Pahang, in 1921. A note on the species was published in the *Bulletin of the Raffles Museum* (No. 5, August 1931), subsequent to which several specimens were obtained in Johore. I have mentioned that it is only in recent years that *Sus barbatus* has been seen in Malaya, and that its habits are very different to those of the common pig 'cristatus'.

I have just received a letter from a friend in Johore to whom I had sent copy of my notes, and what he writes is so interesting, that I feel I must pass on the information to your *Journal*.

My friend, Mr. Miller Mackay, who lives in Johore, has to make occasional visits to a rubber estate on the island of Kapala Djering in the Rhio Archipelago, and he tells me that about once in a year large herds of pig attack and do considerable damage to his rubber trees.

The common pig lives on the island but does no damage and it is only occasionally that the other pig is responsible. The island is a small one, and, while the common pig is frequently met with, the other one is never seen except for its periodical excursions on to the estate, and the conclusion is that it does not live there but must swim across from neighbouring islands. Mr. Mackay tells me that his Javanese coolies state they have actually seen herds swim over at nights. The nearest island is fully a mile away.

Crocodile (Malay: *Buaya*).

Crocodiles are found in all the rivers and creeks on the west coast of the peninsula, and it is surprising what little alarm it causes the people. I have seen men bathing on one side of the river in full view of a monster croc basking on the opposite bank, while one sees boys under seven and eight years of age manoeuvring tiny shallow boats across a river infested with crocs. It is unusual for a crocodile to take to man-eating in the sense that a tiger does. I know of two, only one of which was a real man-eater. It was at a place called Buloh Kasap in the State of Johore. When I was living there I frequently had reports from Chinese shopkeepers and vegetable-growers that they had lost dogs and poultry which had strayed too near the water's edge. I did my best for them, but this beast was more cunning than several others I had shot further down stream.

He was never seen on the near side, and the far side which bordered the jungle was out of range. I got him eventually, and when he was cut up we found two dog-collars and a silver bangle, very bent and broken. A crowd had gathered round to watch the operation, and when the bangle came to light an old man burst into tears and said it was his little girl's bangle, and that

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she had been missing from the house since the previous morning. I had no proof that this particular crocodile had killed other people, and possibly the little girl was his first and only victim. Some years afterwards the District Officer (Mr. Wilson) told me that another crocodile, also at Buloh Kasap, had taken six or seven men, and was still at large at the time he spoke to me.

I shot my beast in 1905 and I think it was in 1918 that I met Mr. Wilson. I managed to shoot quite a number but none of them were very big. The largest measured about twelve feet, the biggest stuffed crocodile in the Raffles Museum, Singapore, measures 14½ ft. Its skull is 22 in. long. The Director of the Museum who very kindly gave me this information says that 'the largest crocodile skull (*C. porosus*) in the museum measures 26 in.' He adds that 'there is a well authenticated record of a crocodile (*C. porosus*) collected in 1820 in Luzon which had a skull measuring 34¾ in. The animal was 29 ft. long and 11 ft. in girth round the forelimbs.' In the same museum can be seen a crocodile with not a tooth in its head. It was shot by Mr. G. P. Owen on Singapore Island.

Snakes.

There is a great variety of snakes in Malaya but only a few of these are poisonous. The cobra, a black variety, is quite common. I have killed at least twenty myself and have seen many more killed by others. The banded krait is not common, but I have shot three or four while out snipe shooting. The hamadryad is not often seen but the Malays in North Johore told me it was quite common in the Segamat district. I shot three and saw four or five others. These notes point to it that the country is not lacking in poisonous snakes, and yet it is a fact that deaths from snake-bite are rare. Thousands of people in India die of snake-bite every year, and in the thirty years I spent in Malaya I did not hear of even one case of a person being killed. It is recognized that the density of the population is nothing like what it is in India, but if it can be ascertained that persons have been bitten and that none have died, the theory must be advanced that the poison of the snakes there is less virulent. I once saw an Airedale dog recover after being struck on the ear by a big cobra. Nothing was done to the dog beyond washing the wound with a solution of carbolic acid. The cobra is of the black variety only, and has no marking on the hood—either monocellate or binocellate.

The brown cobra, the common colour form in India, I have never seen there. The Malay cobra seldom measures more than four feet. One often comes across them on rubber estates, and a few have been killed in houses, chiefly in the bath-room if this happens to be on the ground floor. It is very seldom indeed that snakes of any description are seen in the towns. I have mentioned that I have seen as many as seven or eight hamadryads. It was not always that I had a tape handy to make measurements, but to the best of my knowwledge, with one exception, none measured as much as thirteen feet. The exception is a very big one which was killed by a member of my staff, Mr. Stuart Mackay, who

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presented the skin to the Batu Anam Club. This specimen was of a darker colour than the others I had seen, but it was not black. It was about seventeen feet long, a few inches more or less, and as this is perhaps a record and a matter of interest, I have written for particulars to a doctor friend of mine still in that district.

Ninenty-nine per cent of the Europeans you meet in Malaya will tell you that the hamadryad will always attack a man whether it is provoked or not. My experience has taught me that this is not so. Like all other snakes, the hamadryad invariably tries to get out of Man's way; but like the cobra and certain other snakes, it will fight if cornered or to protect its young. It is a fast moving snake and if it was really out to kill, few men would escape. On two occasions I saw a hamadryad in an angry mood. Once while motoring along a straight bit of road I ran over the tail of one, and pulling up to see what might happen I saw the brute in the middle of the road with head raised and facing me. I had no gun and feeling sure he was about to make for me I moved off quickly.

On another occasion as one of my assistants was walking towards me in a new clearing I saw him turn round suddenly and run off as fast as he could and presently I spotted a big snake going after him.

Johnstone was a fair runner and he did not stop till he had done a good quarter mile. He was going in the direction of his house where I knew he kept a gun, and as I could not assist at the moment I remained where I was and soon had the satisfaction of seeing the snake return and climb into the hollow of a big tree stump. Johnstone returned shortly, fortified as he told me with a 'B and S' and with his gun. A lump of mud thrown at the tree brought out the snake which was shot. It was about ten feet long, and when we investigated the nest we found eight youngsters some just hatched and some about to hatch, and these we quickly despatched. The youngsters were all black, but the mother was the colour of the cobra of India. All the big hamadryads I have seen were of this light brown colour, but there is a plaster cast in the Singapore museum showing the snake as jet black, and I have wondered whether there are both black and brown adults among these snakes. I am afraid I was not of an enquiring turn of mind at that time.

Another poisonous snake is a little beast measuring not more than twelve to fifteen inches. I say it is poisonous because the Malays told me so, and because they seemed to dread it more than they did the cobra. It has a habit of lying across a path and of not being disturbed by approaching foot-steps and for this reason is more frequently stepped on by bare feet than other snakes. In colour it is a shiny black, and has a red blob looking like sealing wax on its flat head. I did not see more than three or four of these snakes, and I do not think it is common.

The writing of these notes has helped me to recall many incidents almost forgotten, and they bring back memories of a happy past in a new country and among people which one grew

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to like, but while the work entailed has given me a great deal of interest and pleasure, I fear that this article will not be looked on in the same way by readers of the *Journal*, and I pass on all blame for faults to be found, or for inabilities to make the matter instructive from the Natural History reader's point of view, to the gentleman who induced and prevailed on my doing this.

I have written as a novice, and as such would beg indulgence.

P.S.—Since completing the article, my friend Dr. Hickey of Batu Anam has written as regards the skin of the hamadryad mentioned in these notes. He tells me that it measures 16 ft. $4\frac{1}{2}$ in. I know that the skin of a tiger measures more than the tiger itself does between pegs, but whether this occurs where a snake is concerned, I am not informed. The skin has possibly shrunk, or perhaps a piece of the tail has come away.

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SOME BUTTERFLIES OF NEPAL.

BY

MAJOR W. G. H. GOUGH.

(*2nd K.E.O. Gurkha Rifles*).

It has often been stated, both in this *Journal* and elsewhere, that a list of the butterflies of Nepal would be welcomed. As far as I have been able to ascertain no such list has ever been made before.

The present list does not pretend to be an exhaustive one; in fact it is impossible for it to be so for several reasons. It is, however, strictly accurate and I am much indebted to the late Mr. O. C. Ollenbach, F.E.S., for his kind assistance in checking through the lists for me. Any species about which doubt exists have been excluded, except where specifically mentioned.

The length of the list is also limited by the fact that I only had three months in Nepal: had I been there longer no doubt more species would have been obtained. During this time I had practically to rely on what I saw or caught myself, but I also had the opportunity of examining the collection of Mr. R. G. Kilburne, the Civil Engineer to the Nepal Government, which provided several examples of butterflies which appeared at other seasons of the year.

It is, however, possible that this list, although short, may serve as a foundation on which a complete list of the butterflies of Nepal may eventually be built up. The country forms the true meeting-point of the Palaearctic and Oriental types of butterflies, and as such is of considerable interest. The area in which collecting is possible is, however, very limited. Broadly speaking it consists of the road into the Valley of Nepal and the environs of the valley itself. The altitudes at which butterflies are obtainable therefore vary at present from 500 ft. to 7,000 ft. Anything beyond this range or outside this area is closed to the European and is likely to remain so.

One point requires to be mentioned. In the lists given below I have endeavoured to stick strictly to what I know to be facts. If, therefore, I state that a butterfly appears at a certain season or elevation it is not to be assumed that it does not appear at other seasons or elevations: I am only stating what I know to be actually the case.

PAPILIONIDAE.

1. **Troides aeacus** Fd.

Flies in September at about 3,500 ft. It is said to be found commonly in the Nepal Valley in the spring, particularly on the Ticona flower.

2. **Byasa aristolochiae aristolochiae** F.

Flies in September and October at about 4,500 ft., but does not appear to be common. The female var. *diphilus* also occurs.

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3. **Byasa philoxenus philoxenus** Gray.
Flies from July to September at about 5,000 ft. to 7,000 ft. During this period it is very common.

4. **Byasa philoxenus polyeuctes** Db.
Found with *B. philoxenus philoxenus*. Nepal appears to be their true meeting-place.

5. **Papilio memnon agenor** L.
Flies in August and September in the Nepal Valley, but is not common. The female var. *alcanor* also occurs.

6. **Papilio protenor euprotenor** Fruh.
Very common in September and October at about 4,500 ft.

7. **Papilio polyctor ganesa** M.
Flies from July to October from 3,000 ft. to 5,000 ft. Common along the bottom of hills and in nalas.

8. **Papilio helenus helenus** L.
Common in September and October at about 4,500 ft.

9. **Papilio polytes romulus** Cr.
Exceedingly common from August to October at about 4,500 ft. Of the three forms of female, that resembling the male and that resembling *Byasa aristolochiae* are both very common. Only one specimen of the female resembling *B. hector* was seen in the Nepal Valley, in October.

10. **Papilio demoleus demoleus** L.
Flies from July to October from 500 ft. to 4,500 ft. Very common, particularly in September and October.

11. **Zetides cloanthus** Wd.
Flies from July to September from 4,000 ft. to 6,000 ft. Not common.

12. **Zetides sarpedon sarpedon** L.
Flies from July to October from 4,000 ft. to 6,000 ft. Common, particularly in September and October.

13. **Zetides agamemnon agamemnon** L.
Fairly common from August to October at about 4,500 ft.

PIERIDAE.

14. **Pieris canidia indica** Evans.
Flies from August to October at about 4,500 ft. Very common during September and October, during which time those on the wing appear to consist almost entirely of females.

15. **Aporia agathon agathon** Gray.
A specimen in Mr. Kilburne's collection.

16. **Delias singhapura agostina** Hew.
Flies in the Nepal Valley during September and October. Not common, and very difficult to take owing to its habit of flying round the tops of tall trees.

17. **Delias eucharis** Drury.
Only one specimen seen, in the Nepal Valley, at the end of October.

18. **Delias belladonna ithiela** But.
Not rare in September and October at 4,000 ft. to 6,000 ft.

19. **Delias descombesi leucacantha** Fruh.
Two specimens in Mr. Kilburne's collection. It was noticeable that in these specimens the black markings underneath were considerably paler than in specimens from Assam. Probably flies in the spring.

20. **Delias aglaia** L.
Not rare at 4,500 ft. in September and October.

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21. **Delias thysbe pyramus** Wall.
Flies from August to October from 4,000 ft. to 6,000 ft. Very common in October.

22. **Catopsilia crocale** Cr.
One specimen taken at 3,500 ft. in October.

23. **Catopsilia pomona** F.
Uncommon in September and October at about 4,000 ft.

24. **Catopsilia pyranthe minna** Herbst.
Flies from July to October from 500 ft. to 4,000 ft. Not many seen but probably common at the lower elevations.

25. **Catopsilia florella gnoma** F.
Uncommon in October at about 4,000 ft.

26. **Gonepteryx rhamni nepalensis** Db.
Common from July to October from 4,000 ft. to 6,000 ft.

27. **Gonepteryx aspasia zaneka** M.
Flies in August at about 7,000 ft. Apparently rare.

28. **Terias venata venata** M.
Only one specimen seen at 3,500 ft. at the end of August.

29. **Terias laeta** Bdv.
One specimen taken at 4,500 ft. in October.

30. **Terias blanda silhetana** Wall.
Common from August to October at about 4,500 ft.

31. **Terias hecabe fimbriata** Wall.
A specimen in Mr. Kilburne's collection.

32. **Terias hecabe hecabe** L.
Fairly common from August to October at about 4,500 ft. The wet season form prevails until about the first week in September.

33. **Terias lacteola sarinoides** Fr.
A specimen taken in the Nepal Valley in October. Mr. Ollenbach remarks that he does not know the name. He thinks it is nearest *sari rotundalis*, but the brown patch at apex reaches both margins.

34. **Colias hyale hyale** L.
Flies in September and October from about 4,500 ft. to 7,000 ft. The female var. *pallida* also occurs. Not common, but is probably plentiful in the spring.

35. **Colias croceus edusina** But.
Not common from August to October at 7,000 ft.

36. **Ixias marianne.**
Very common at 1,000 ft. in November.

37. **Ixias pyrene satadra.**
Very common at 1,000 ft. in November.

38. **Hebomoia glaucippe glaucippe** L.
Fairly common in the Nepal Valley during the latter half of September and in October.

DANAIDAE.

39. **Danais aglea melanoides** M.
Exceedingly common at about 4,500 ft. in September and October.

40. **Danais melissa septentrionis** But.
Fairly common from August to October at about 4,000 ft.

41. **Danais plexippus** L.
Common from July to October from 500 ft. to 4,500 ft.

42. **Danais chrysippus** L.
Very common from July to October from 500 ft. to 4,500 ft.

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43. **Euploea mulciber mulciber** Cr.
Common from August to October at about 4,500 ft.

44. **Euploea core core** Cr.
Very common from July to October from 500 ft. to 4,500 ft.

45. **Euploea core vermiculata** But.
One specimen taken in September at 3,500 ft. Probably common enough in the winter.

SATYRIDAE.

46. **Mycalesis mineus mineus** L.
Not common at 4,500 ft. in September and October.

47. **Mycalesis lepcha lepcha** M.
Flies in the Nepal Valley in October. Rare.

48. **Lethe sidonis vaivarta** Doh.
Flies in the Nepal Valley in October. Rare.

49. **Lethe rohria dyrta** Fd.
Flies in the Nepal Valley in October. Rare.

50. **Lethe confusa confusa** Aur.
Common at 4,500 ft. in October.

51. **Lethe verma sintica** Fruh.
Flies in August at about 7,000 ft. Rare.

52. **Lethe insana dinarbas** Hew.
Flies in August at about 7,000 ft. Rare.

53. **Orinoma damaris** Gray.
Rare at about 5,000 ft. in October.

54. **Aulocera saraswati** Koll.
Common in August and September at about 5,500 ft.

55. **Erebia scanda** Koll.
Very common in August and September at about 6,500 ft.

56. **Erebia annada coeca** Watkins.
A specimen in Mr. Kilburne's collection.

57. **Erebia hyagriva** M.
Very rare in September at about 6,000 ft.

58. **Ypthima lycus lycus** de N.
Flies in August and September at about 6,500 ft. Common in August.

59. **Ypthima nareda newara** M.
Flies in September at 4,500 ft.

60. **Ypthima hubneri hubneri** Kirby.
Flies in the Terai in August.

61. **Ypthima avanta avanta** M.
Rare at 4,500 ft. in August.

62. **Ypthima sakra nikoea** M.
Flies in August and September at about 6,500 ft.

63. **Ypthima sakra sakra** M.
Flies from August to October from 4,500 ft. to 7,000 ft. Common in August.

64. **Ypthima sakra austeni** M.
Rare in August at 7,000 ft. Probably the westernmost limit of its range.

65. **Orsotrioena medus medus** F.
Fairly common in thick jungle at about 4,500 ft. in September and October.

66. **Melanitis leda ismene** Cr.
Very common from August to October from 4,500 ft. to 7,000 ft. The wet-season form prevails until about the middle of September.

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67. **Elymnias malelas malelas** Hew.
Flies at 4,500 ft. in September and October. Common in October.

NYMPHALIDAE.

68. **Sephisa chandra** M.
Not rare at about 5,000 ft. in October.

69. **Euripus consimilis consimilis** Wd.
One specimen taken at 1,000 ft. in August. It is heavily marked with black and is the same as *consimilis meridionalis* from South India.

70. **Diagora persimilis persimilis** Wd.
Very rare at 4,500 ft. in September.

71. **Hestina nama** Db.
Very common from August to October at about 6,500 ft.

72. **Stibochiona nicea nicea** Gray.
Flies in September at about 5,000 ft.

73. **Euthalia lepidea lepidea** But.
Flies from August to November. Fairly common in the Terai in the latter month.

74. **Euthalia sahadeva sahadeva** M.
Not rare from August to October from 4,500 ft. 7,000 ft.

75. **Limenitis dudu** Wd.
Flies in October at about 5,000 ft.

76. **Limenitis procris procris** Cr.
Flies in July and August at about 3,000 ft.

77. **Pantoporia cama** M.
Flies in October at about 4,500 ft.

78. **Pantoporia opalina opalina** Koll.
Flies in October at about 4,500 ft.

79. **Pantoporia opalina orientalis** El.
Flies from August to October from 4,500 ft. to 7,000 ft.

80. **Pantoporia perius** L.
Fairly common from August to October from 3,500 ft. to 7,000 ft.

81. **Neptis hylas varmona** M.
Not common at 4,500 ft. in October.

82. **Neptis hylas astola** M.
Very common from August to October from 4,500 ft. to 7,000 ft.

83. **Neptis hylas adara** M.
Fairly common in September and October at 4,500 ft.

84. **Neptis soma soma** M.
Not rare in October at 4,500 ft.

85. **Cyrestis thyodamas ganescha** Koll.
A specimen in Mr. Kilburne's collection.

86. **Hypolimnas misippus** L.
Flies in September at 4,500 ft. Only males were seen.

87. **Hypolimnas bolina** L.
Very common from July to October from 1,000 ft. to 7,000 ft.

88. **Kallima inachus huegeli** Koll.
Flies in October at 4,500 ft.

89. **Kallima inachus inachus** Bdv.
Flies in August.

90. **Precis hierta hierta** F.
Flies in July at about 6,000 ft.

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91. **Precis hierta magna** Evans.
A specimen in Mr. Kilburne's collection which I take to be this, but there is so little difference between this and *hierta hierta* that it is difficult to tell with certainty.

92. **Precis orithya swinhoei** But.
Common from July to October from 4,500 ft. to 7,000 ft.

93. **Precis orithya ocyale** Hub.
A specimen in Mr. Kilburne's collection. Again, the difference between this and *swinhoei* is so slight that it is difficult to be certain.

94. **Precis lemonias persicaria** Fruh.
Flies at 3,500 ft. from August to October.

95. **Precis almana almana** L.
Flies from August to October at 4,500 ft. The wet-season form prevails until September.

96. **Precis atlites** L.
Very common at 4,500 ft. in October.

97. **Precis iphita siccata** Stich.
Flies from August to October from 4,500 ft. to 7,000 ft.

98. **Precis iphita iphita** Cr.
Flies from August to October from 4,500 ft. to 7,000 ft. I have included both the above, but once again there is so little difference between the two that it is difficult to be certain. The species is very common.

99. **Vanessa cardui** L.
Flies from August to October at 7,000 ft. For some reason it does not appear to be common.

100. **Vanessa indica indica** Herbst.
Very common from July to October from 4,500 ft. to 7,000 ft.

101. **Vanessa canace canace** L.
Common from August to October at 7,000 ft.

102. **Vanessa cashmirensis aesis** Fruh.
Flies from July to October from 4,500 ft. to 7,000 ft. Very common in August and September.

103. **Symbrenthia hippoclus khasiana** M.
A specimen in Mr. Kilburne's collection.

104. **Symbrenthia hypselis cotanda** M.
Flies in August and September from 4,500 ft. to 7,000 ft.

105. **Argynnis hyperbius hyperbius** L.
Common from August to October from 4,500 ft. to 7,000 ft.

106. **Argynnis childreni childreni** Gray.
Flies in October at about 6,000 ft.

107. **Argynnis lathonia issoea** Db.
Flies in October at 7,000 ft.

108. **Cupha erymanthis lotis** Sulz.
Flies in September at 4,500 ft.

109. **Atella phalanta** Drury.
Flies from August to October from 4,000 ft. to 6,000 ft. Common in the Nepal Valley in September.

110. **Issoria sinha sinha** Koll.
Flies from July to October from 500 ft. to 4,000 ft.

111. **Cethosia biblis tisamena** Fruh.
Very common at 4,500 ft. in September and October.

112. **Ergolis ariadne pallidior** Fruh.
Flies in October at 3,500 ft.

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113. **Pareba vesta vesta** F.
Flies in August and September at 7,000 ft.

ERYCINIDAE.

114. **Libythea lepita lepita** M.
Flies in October from 4,500 ft. to 7,000 ft.

115. **Libythea myrrha sanguinalis** Fruh.
A specimen in Mr. Kilburne's collection.

116. **Zemeros flegyas indicus** Fruh.
Common from August to October from 5,000 ft. to 7,000 ft.

117. **Dodona durga** Koll.
Flies in October at 7,000 ft.

118. **Dodona dipoea nostia** Fruh.
Flies in October at 7,000 ft.

119. **Dodona eugenes eugenes** Bates.
Flies from August to October from 4,500 ft. to 7,000 ft.

120. **Dodona eugenes venox** Fruh.
Flies from August to October at 7,000 ft.

121. **Dodona egeon** Db.
Flies in October from 4,500 ft. to 7,000 ft.

122. **Dodona ouida ouida** M.
Flies in August at 7,000 ft.

123. **Dodona adonira adonira** Hew.
Flies from August to November from 5,000 ft. to 7,000 ft.

124. **Abisara fylla** Db.
Flies in October at about 6,000 ft.

LYCAENIDAE.

125. **Euchrysops cnejus** F.
Flies in August in the Terai.

126. **Everes argiades diporides** Chap.
Flies in October at 4,500 ft.

127. **Lycaenopsis marginata** de N.
Common in August at 7,000 ft.

128. **Lycaenopsis puspa gisca** Fruh.
Flies from July to October from 4,500 ft. to 7,000 ft.

129. **Lycaenopsis limbata placida** de N.
Flies in August at 7,000 ft.

130. **Lycaenopsis argiolus jynteana** de N.
Flies in August at 7,000 ft.

131. **Zizera maha maha** Koll.
Flies from August to October from 4,500 ft. to 7,000 ft.

132. **Zizera lysimon** Hub.
Flies in August and September from 4,500 ft. to 6,000 ft.

133. **Catachrysops strabo** F.
Flies in August at 4,500 ft.

134. **Catachrysops lithargyria** M.
Flies in the Terai in August.

135. **Lampides boeticus** L.
Flies in September at 4,500 ft.

136. **Jamides bochus bochus** Cr.
Flies in October at 7,000 ft.

137. **Jamides celeno celeno** Cr.
Flies from August to October from 1,000 ft. to 4,500 ft.

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138. **Jamides elpis eurysaces** Fruh.
Flies in August at 4,500 ft.

139. **Heliophorus epicles indicus** Fruh.
Flies in October at 5,000 ft.

140. **Curetis thetis** Dry.
Flies in September at about 1,500 ft.

141. **Amblypodia eumolphus eumolphus** Cr.
Rare at 4,500 ft. in October. Very dark on the underside, but on the upperside much the same as specimens from Sikkim.

142. **Amblypodia areste areste** Hew.
A specimen in Mr. Kilburne's collection.

143. **Spindasis lohita himalayanus** M.
Flies in August at 4,500 ft.

144. **Deudoryx epijarbas ancus** Fruh.
Flies from August to October at 4,500 ft.

145. **Deudoryx epijarbas amatius** Fruh.
Flies in August and September at 4,500 ft.

146. **Virachola perse perse** Hew.
Flies in October at 4,500 ft.

147. **Rapala nissa nissa** Kollar.
A specimen in Mr. Kilburne's collection.

HESPERIIDAE.

148. **Rhopalocampta benjaminii benjaminii** Guer.
A specimen in Mr. Kilburne's collection.

149. **Badamia exclamationis** Fab.
Flies in August at 4,500 ft.

150. **Celaenorrhinus pulomaya** M.
Flies in September at 3,500 ft.

151. **Tagiades menaka** M.
Fairly common in October at 4,500 ft.

152. **Hesperia galba** F.
A specimen in Mr. Kilburne's collection.

153. **Udaspes folus** Cr.
Common in September at 4,500 ft.

154. **Notocrypta feisthamelii alysos** M.
A specimen in Mr. Kilburne's collection.

155. **Notocrypta curvifascia** Fd.
Flies in September at 4,500 ft.

156. **Erionota thrax thrax** L.
Flies in September and October at 4,500 ft.

157. **Baoris sinensis sinensis** Mab.
Flies in August from 4,500 ft. to 7,000 ft.

158. **Baoris conjuncta conjuncta** HS.
A specimen in Mr. Kilburne's collection believed to be this species.

159. **Baoris eltola** Hew.
Flies in October at 4,500 ft.

160. **Baoris guttatus guttatus** Brem.
Flies from August to October at 4,500 ft.

161. **Baoris guttatus bada,** M.
Flies in October at 4,500 ft.

162. **Baoris bevani bevani** M.
Flies from August to October at 4,500 ft.

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CUCKOO-LORE.

BY

LIEUT.-COL. R. W. BURTON,

Indian Army (Retired).

Our hardworking Editors have asked that articles of general interest may be contributed to further popularize the *Journal* and attract more members.

In the back numbers of the *Journal*, all of which are not within reach of many of our members, is much information concerning cuckoos contributed by well-known ornithologists, chief among whom is Mr. Stuart Baker. He, and other notable observers whose recorded observations are now freely made use of, will no doubt forgive one who has no claim whatever to be considered an ornithologist, or oologist, in consideration of the laudable motive by which this article is inspired.

Of 'The Cuckoo in the Nest' and 'The Cuckoo in Harley Street' most of us have heard; and there are sundry expressions which have obtained permanent place in the English language. The Common Lily of Great Britain (*Arum maculatum*) known to our childhood as 'lords and ladies', is the 'cuckoo-pint'; the 'Ragged Robin' is the 'Cuckoo-Gilliflower'; and the Wryneck, commonly arriving in England a few days before the male cuckoo, is known as 'cuckoo's leader' or 'cuckoo's mate'; and there are 'cuckoo clocks' to be found in many a cottage home.

Then there is 'cuckoo-spit', the frothy secretion found upon plants and produced by the immature nymphal stage of various plant-lice, some of which, in the adult condition, are known as 'frog-hoppers'; and there are 'cuckoo-flies' which have some resemblance to the common house fly, and are parasitical on the larvae of other insects.

In Old English literature several rhymes anent the cuckoo are to be found, the most notable being 'The Cuckoo and the Nightingale' by Sir Thomas Clanvowe, published in 1532. There is a Cuckoo Song (*circa* 1250) of three stanzas, the first of which is:—

Sumer is icumen in,
Lhude sing cuccu!
Groweth sed, and bloweth med,
And springth the wude nu—Sing cuccu!

Then, about 1580, John Haywood wrote:—

In April the Cuckoo can sing her song by rote.
In May oft-time she cannot sing a note.
At first, koo, koo; koo, koo; sings till she can do
At last; kooke, kooke, kooke; six kooke's to one koo.

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From the North of England comes:—

In April cuckoo says her lay;
In May she sings both night and day,
In June she loses her sweet strain,
In July she is off again.

which contains the misstatement, according to our modern knowledge, that it is the hen bird which sings.

Lastly there is a more recent lilt:—

The schoolboy wandering through the wood,
To pluck the primrose gay,
Starts, thy curious voice to hear,
And imitates thy lay.

which we can all remember to have done in our early days!

As a harbinger of spring the cuckoo is always welcome to the ears of those who have just passed through the severities of winter; and probably no single wild bird in creation has attracted so much popular attention, or has been so much written about, as the Common Cuckoo: yet, even to this day, there are matters still requiring investigation in regard to its habits and oology.

The Cuckoo of the United Kingdom is *Cuculus canorus*. It is found practically over the whole of Europe and Western Asia. Towards the end of March 'the harbinger of spring' proclaims his arrival by his loud far-sounding song—for song it is in the technical sense of the word, being confined to the male sex and the season of love. In a few days the hens arrive, and then can be noticed the amorous contests between keen and loud-voiced suitors. Even by night they are not silent, being particularly vocal by moonlight.

The birds avoid observation as much as possible, for they are frequently pursued by all the small birds of the neighbourhood, which take them to be hawks on account of their resemblance in appearance and flight to a bird of prey.

As the season advances the call alters, the voice 'breaks', and the bird is no more heard. By the middle of July an old bird is seldom seen. A male cuckoo has, however, been known to remain all the winter, and to call too! a very unusual and strange occurrence: perhaps the bird had suffered some injury to prevent migration.

In winter the European Cuckoo migrates across the Mediterranean to North Africa and visits Arabia, Persia and North-West India. 'A cuckoo ringed in a Pied Wagtail's nest near Eton, Buckinghamshire, met its end in a jungle clearing of the French Cameroons via the arrow of a native.' (*The Observer*, 5-11-1933.)

Much of the curiosity and interest attached to the cuckoo is caused by its singular habit of entrusting its offspring to foster-parents. In the United Kingdom, among the foster-parents more commonly selected are the Pied Wagtail, the Titlark, and the Hedge Sparrow, the last-named being particularly complacent in brooding eggs of wholly different colour to her own. There are some sixty British birds known to have been duped by the cuckoo; and in Europe the foster-parents selected cover a large assortment

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ranging from the tiny Fire Crested Wren to the larger shrike, so the cuckoo is no fool! 'Dr. Rey gives a list 146 such' (Stuart Baker, *Bombay Natural History Society's Journal*, vol. xvii, p. 80) (in future, for short, xvii, 80, and so on).

In India the number of observed foster-species of the Common Cuckoo[1] is 32 (Stuart Baker, xvii, 78 and 881 and xxii, 625) and doubtless there are many others which will be added to this list.

In the selection of the nest the female cuckoo is exceedingly cautious and secretive. Sometimes, when the nest is large enough and favourably situated, she will lay her egg in it; but in probably the large majority of cases she lays her egg on the ground and introduces it by her bill into the nest. For this action the bird is peculiarly fitted, the mouth being wide and the gape curiously flexible. Perhaps it is to aid this habit that the egg of *canorus*, considering the size of the bird, is remarkably small being about the same size as that of the skylark, a bird about a quarter of its size.

On occasion she will, when depositing her own egg, remove one of the rightful eggs from the nest; and sometimes two different hens will lay in the same nest. In such cases the weaker cuckoo of the two hatched out will suffer the usual fate. This dual laying is due to some vagrant cuckoo, unable to find a territory of her own, having through necessity to trespass on the area of another; and she will have to be exceedingly quick in her operations, for a dominant cuckoo, mistress of her own pitch, will brook no rival, especially if the latter be parasitic upon the same species as herself.

It is a remarkable circumstance that the cuckoo (*C. canorus*) places her eggs only in the nests of those birds which have soft bills and feed on insects and, like herself, have membranaceous stomachs suited to the soft food; while she avoids the nests of those birds that feed on grain and have strong muscular gizzards.

The food consists largely of hairy caterpillars, and on rare occasions the mother has been observed to feed its own young; while there is one reported instance (xvii, 79) of the Common Cuckoo hatching its own eggs and rearing the young.

In some cases the eggs have more or less resemblance to those of the foster-parents, and it may be a provision of Nature, increased by a process of natural selection, that the eggs laid by *canorus* as a whole vary much in appearance. And it is possibly by an inherited habit that a cuckoo will become parasitic on one particular species; it having been found by its ancestors that this particular species is more readily deceived, or is more tolerant to the imposition. There are many recorded observations in support of this.

It is unquestionable that whatever variations there may be among the eggs laid by different individuals of the same species, there is a strong family resemblance between eggs laid by the

[1] The European Cuckoo (*Cuculus canorus canorus*) does not breed within Indian limits. The two allied forms breeding in our area are the Asiatic Cuckoo (*C. c. telephonus*) and the Khasia Hills Cuckoo (*C. c. bakeri*).—Eds.

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same individual, even after a lapse of years; and it can hardly be questioned that the eggs of the daughter would tend to resemble those of her mother.

In his Additional Cuckoo Notes (xvii, 876 et seq., and xviii, 275) Mr. Stuart Baker adds much to our knowledge of this subject; his observations being opened up by suggestions (1906) by Professor Burnett of Hyderabad.

'To commence with (p. 889) we have the broad fact that our Cuckoos which lay blue eggs—that is *Hierococcyx varius* (the Common Hawk Cuckoo) and the genus *Clamator* (the Crested Cuckoos)—practically invariably deposit their eggs in the nests of such birds which like themselves lay blue eggs. All over India fosterers of this description are available in considerable numbers and there is no further need for adaptation, and accordingly we find there is none, and no one has ever taken an egg of the above cuckoos of any other colour but blue. Of course there are rare exceptions to the usual fosterers selected, such as the egg of *Clamator jacobinus* (the Pied Crested Cuckoo) found in the nest of *Garrulax leucolophus* (the Himalayan White-crested Laughing Thrush) but these exceptions are too few to have any influence on either eggs or parent.'

'It is possible that the want of discrimination displayed by the Common Cuckoo as to where it should put its egg, has resulted in the marvellous variety of types and colours found in it. At the same time it is possible that the egg is more or less adapting itself to local requirements in those localities in which any one fosterer greatly predominates. To accord with this it is however necessary to presume that cuckoos are regular in their migratory habits and visit the same breeding range one generation after another.'

Then as to the Small Cuckoo (*C. poliocephalus*) of India:—

'On the whole, therefore, it may be taken as probable that the Small Cuckoo lays eggs which adapt themselves to their surroundings. The Indian Cuckoo (*C. micropterus*) lays very pale blue eggs and selects most often fosterers such as *T. lineatum* and *L. brunnea*, which also lay blue eggs. Here the colour of the Cuckoo's eggs would certainly seem to have adapted itself to that of the type of fosterer's egg with which it is generally found.'

Of the Large Hawk Cuckoo (*H. sparveroides*), Mr. Stuart Baker finds that it adapts its egg in various parts of the country to the eggs of the selected foster-parent: and it is a fact that the Common Hawk Cuckoo 'has arrived at complete adaptation and invariably places its deep blue eggs in nests of fosterers which lay eggs of a similar colour'; (again: the cuckoo is no fool!) and he goes on to describe remarkable instances of what appears to be adaptation on the part of the Plaintive Cuckoo (*Cacomantis passerinus*) and closes with the remark that 'knowledge as to the eggs of other species of Indian cuckoos is not yet sufficient to allow of generalization.'

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> And he finally sums up as follows:—(p. 892) 'On the whole, therefore, Indian Cuckoos would appear to adapt themselves more or less to producing eggs which to some extent resemble those of the birds they select as foster-parents to their young. In this way such Cuckoo's eggs as approach most nearly in colouration to those of the foster-parents would survive, whilst those which greatly differ would gradually be eliminated.'
>
> It may be that Nature is at work on these lines, but there are other views. Mr. Douglas Dewar is of opinion (xvii, 775) that the theory that Cuckoo's eggs are 'mimic' those of the host is not tenable; and Dr. Bernard Rensch of the University Zoological Museum, Berlin, is quoted as believing (xxxiv, 1068) 'that all the discrimination and selection is exercised exclusively by the hosts. Only such cuckoo's eggs as approximate in appearance to those of the hosts succeed in being accepted, while those that are obviously strange are either cast out or not incubated at all (i.e. nests are deserted). This manner of selection has evolved distinct groups among the cuckoos (each group laying a distinct type of egg), who from generation to generation resort for egg-laying only to the nests of such species as they themselves were fostered by. The selection exercised by the hosts, which destroys all eggs of strange appearance tends to "the survival of the fittest"; in other words it conduces to perfecting the resemblance between the eggs of the parasite and those of its host.'

The above quotation is from an article by Mr. Salim A. Ali in which he describes how he 'played cuckoo' on certain small birds to elucidate the matter; and so far as his few experiments go they appear to support Dr. Rensch.

The reader now has a fairly complete summary of this matter; and those specially interested can realize that there is plenty of scope for future observation in this field; more especially in India and the East.

To continue the habits of the European cuckoo (*C. canorus*). When the eggs are hatched there ensues the murderous eviction of the rightful tenants by the young cuckoo, who is especially equipped for the deed by his broad hollow back and disproportionately strong thighs, though his hollow back soon fills in (by the twelfth day) and the adult bird has rather weak than strong legs.

The eviction is effected by getting the tail under each egg, or young bird, in succession, wriggling them on to its back, and then cleverly pitching them over the side of the nest. In its earlier days only the eggs are evicted, the murderous deed being committed at a more advanced age. A young cuckoo has been observed to evict its brother in the nest, and probably always does so, victory being to the strongest.

An accurate observer of early in the last century (Jenner, quoted by Blackwall in the *Memoirs of the Literary and Philosophical Society of Manchester*) describes the process of eviction.

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'The young cuckoo, soon after it is excluded from the egg, commences the extraordinary practice of turning out its companions, which are usually left to destruction. The mode of accomplishing this is very curious. With the assistance of its rump and wings it contrives to get a young bird upon its back; and making a lodgment for its burden by elevating its pinions, clambers backward with it up the side of the nest till it reaches the top, where, resting for a moment, it throws off the load with a jerk and quite disengages it from the nest. It remains in this situation for a short time, feeling about with the extremities of its wings as if to be convinced whether the business is properly executed, and then drops into the nest again.

It frequently examines, as it were, an egg or nestling with the ends of its wings before it begins its operations; and the nice sensibility which these parts appear to possess seems sufficiently to compensate for the want of sight, of which sense it is at first destitute.'

Now we can say farewell to the young cuckoo which, having been well fed and cared for by his solicitous foster-parents, begins to shift for himself by the end of September and soon follows the remainder of his kin to more southern climes.

Let us now turn to the Indian Empire and see what there is known, or to be known, as to the many cuckoos in the various countries of diverse climates included within it.

For the reason that this article is primarily intended for the general reader (also to collect in one place all the 'cuckoo-lore' to be found in the *Journals* of the Society) it seems well, with the presumed permission of Mr. Stuart Baker, to give the following extract from his series of articles on 'The Oology of Indian Parasitic Cuckoos' published in 1906-07 in volume xvii of the *Journal*.

'Our Indian cuckoos of the family *Cuculidae* (the Order is *Coccyges*) are divided by scientists into two sub-families—the *Cuculinae* and the *Phoenicophainae*: the genera composing the former have the shanks or tarsi more or less feathered, whereas those of the latter have them quite naked. The only parasitic cuckoo belonging to this second group is the Common Indian Koel (*Eudynamis scolopaceus*), all our other parasitic cuckoos belonging to the former.

The general outward appearance of the family is passerine, but the feet are zygodactyle, i.e., the first and fourth toes both point backwards, as in woodpeckers and others. The feet and legs are also, as a rule, exceptionally feeble, but the wings are strong, and generally long and pointed, so that cuckoos have swift flight; the bill is slightly curved throughout, the gape rather wide and frequently conspicuously coloured.

The species of the genus *Cuculus*, containing the Common English Cuckoo, and of the genus *Hierococcyx*, which con-

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tains the Brain Fever Bird, are very hawk-like in their barred and banded plumage.'

Our Indian parasitic Cuckoos are divided into eight genera, and, including one bird peculiar to Ceylon and another a rare straggler into Burma, number 23 species, with 17 of which we will proceed to deal with the expert guidance of Mr. Stuart Baker and his allied ornithologists.

With Mr. Stuart Baker's series of articles (xvii, 72, 351, 678, 876) will be found excellent coloured plates illustrating the eggs of all these species, also of the koel.

Since the series of articles referred to was published in 1907 the Indian forms of the Common Cuckoo (*Cuculus canorus*) has been separated into two races, the Asiatic Cuckoo (*C. canorus telephonus*) and the Khasia Hills Cuckoo (*C. canorus bakeri*); but as this separation was not effected at the time it is best to bracket them in this paper.

(1) Neither of the two races can be distinguished by the casual person in voice or appearance from the European bird. So widely distributed is this familiar bird that it is to be heard in the same month of May (here I write also from personal observation) amid the melting snows of the Himalaya (Kashmir, Kishtwar, Kunawar) up to an elevation of 11,000 ft., in the sweltering jungles of the Central Provinces and Hyderabad, in several parts of Burma, also in South India; and its distribution includes Ceylon.

Within our limits 'it breeds throughout the Himalayas and sub-Himalayas, the Hilly forest country of Chota-Nagpur and the Nilgiris, the plains of Assam at the foot of the Hills, and the Burmese Hills. Having been heard to call in the breeding season in the Hills of the Central Provinces no doubt it breeds there also.' For Shan Hills, Burma, also see Livesey, xxxvi, 997, where 'the resemblance of the eggs to those of the principal foster-parent is most marked'; also 14 blue eggs were found: and B. B. Osmaston, xxiv, 359, and Mackenzie, xxv, 742.

A blue egg is not common, and for long it was doubtful if a blue egg is ever laid. As Mr. Stuart Baker emphasises, *no cuckoo egg is beyond doubt unless taken from the oviduct of the bird.* A blue egg was obtained in this way in 1907 by Major H. A. F. Magrath in the Thandiani Hill (40 miles from Murree in the Punjab) and he was of opinion that *canorus* mostly lays blue eggs on that hill.

The tropical laid egg of *canorus* appears to be larger than that of the European bird and averages .91 in. × .67 in., the largest obtained being 1.04 in. × .75 in.

(2) The Himalayan Cuckoo (*C. saturatus*) is the next bird. One observer has witnessed the feeding of young birds of this cuckoo by its own parent or some other bird of the same species.

'The cry is a pleasant musical call; a four-syllable one of four deep whistles or hoots, very much like that of the hoopoe but rather higher in tone: and there is a preliminary high note, not easy to hear unless quite close.'

'The egg is typically elliptical, very smooth and fine grain, pure white, minutely speckled and dotted with black or dark

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brown.' Illustrated in Pl. I, opp. p. 72 and averages .85 in. × .55 in.

(3) The Small Cuckoo (*C. poliocephalus*) extends during the breeding season from the Himalayas to Assam, and thence easterly through North Central China to Japan; also Malay Peninsula, Java, and Borneo. B. B. Osmaston records it in Burma (xxiv, 360). 'In the cold weather it may be found practically anywhere in India and Ceylon, and more than probable, as time goes on, it will be found breeding in the Southern Hill ranges as well as the sub-Himalayas.'

'Its call is a disyllabic note twice repeated, but it has a variety of notes and is rather a noisy bird, and, though some of its notes are more or less musical, others are quite the reverse.'

Two types of egg are illustrated in Pl. I. One is 'nearly uniform pale pinkish-chocolate' the other 'pure white and glossless'. The eggs are like those of *saturatus*, average size .83 in. × .58 in.

(4) The Indian Cuckoo (*C. micropterus*) is familiar to all as the Broken Pekoe Bird whose cry has been variously rendered, 'Make-more Pekoe', 'Bo-kata-ko' (Bengali), 'Naflang-kaiko' (Cachari, 'who-stole-the-fish'), 'Kaphul-pakka', and by the British soldier 'Lost-my-rifle'.

This cuckoo 'has been found practically everywhere in India, except the driest portions of the North-West, and it doubtless breeds more or less over the whole of its habitat, ascending higher up during the breeding season and migrating locally at this time from places where there are no suitable forests or hills. It extends right away through Burma into Malaya, and again through Northern Burma into Central Asia, Siberia, China, and Japan.'

As instancing how difficult is the oology of cuckoos, Mr. Stuart Baker has to record (xvii, 884) 'No oviduct egg has as yet (1907) been got of this bird, but all the evidence obtainable confirms Colonel Rattray's identification of this bird's eggs.'

The egg is '*in all probability* pale blue, rarely faintly marked. Fine silky texture. Shape broad oval.' Four specimens are illustrated in Pl. II, opp. p. 364, average size .92 in. × .70 in.

The next genus of the sub-family *Cuculinae* is *Hierococcyx*, of which there are five species, the difference consisting in the comparative lengths of the inner wing quills. Of the five, two are common in India and known to all as the Brain Fever Birds.

(5) The Large Hawk Cuckoo (*H. sparveroides*) is not the true Brain Fever Bird, rendering pride of place in that respect to the next following songster.

Its voice is not unlike that of the koel, but is less harsh and penetrating, and can be construed *pi-pee-ah, pi-pee-ah*, with emphasis on the second syllable, in ascending scale. It is noisy during moonlight nights, and a torment to would-be sleepers.

Distribution is 'throughout the Himalaya as far West as Chumba, ascending in summer to elevations of 9,000 ft. or more: probably scattered here and there over the better wooded parts of the Indian Peninsula in the cold season, but only recorded from Raipur in the Central Provinces. Common on the Nilgiris

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in South India, but not observed in the Palnis, the Travancore Ranges, nor the Ceylon Hills. To the eastward this cuckoo is found throughout the hills south of Assam and Burma, ranging to China, Japan, the Philippines, the Malay Peninsula and Borneo.'

It is parasitic on Laughing Thrushes, Babblers, and other birds. For a long time Colonel Rattray was the only man who had taken an absolutely authentic egg of this cuckoo; but in 1906 Mr. Stuart Baker was fortunate in obtaining four blue eggs. Mr. A. E. Osmaston (xxi, 1330) contributes an article on the oology of this bird. The eggs taken by him are large: average size 1.13 in. × .82 in.

The egg is 'pale blue, long oval, stout, hard texture, glossy and not very fine. *Possibly* also chocolate-brown.' Illustration in Pl. II, average size .97 in. × .73 in.

(6) The Common Hawk Cuckoo (*H. varius*). Now we meet the *true* 'Brain Fever Bird' beloved of all sick Europeans in India, though the Koel and the Large Hawk Cuckoo are often so called locally, especially where the Common Hawk Cuckoo is absent.

Its note is the same *pi-pee-ah, pi-pee-ah*, as that of *sparveroides;* but it is even more shrill and penetrating, and the bird itself even more persistent. Night or day seems much the same to it, and when the nights are very dark it awakes with the dawn and has double the energy to expend on destroying the rest of everyone within hearing.'

'It is found all over India and Ceylon, being a resident, though perhaps locally migrating, throughout its range.'

The egg is illustrated in Pl. II. 'Blue, texture like satin. Shape elliptical or spheroidal.' Average size 1 in. × .75 in. Mr. B. B. Osmaston records (xxviii, 453) that it breeds around Pachmarhi in the Central Provinces.

(7) Hodgson's Hawk Cuckoo (*H. nisicolor*) 'is a bird of the north-eastern portion of India only, being found east from Nepal through the Himalaya and the adjoining plains of Assam, Cachar and Sylhet, through Manipur and Burma to the extreme south where it meets the similar form called *fugax* (the fourth species of this genus) which may be known by its larger bill.'

'Its ordinary note is a rather shrill copy of that of *sparveroides* and *varius*, but it is not incessantly repeated, and does not ascend and descend in scale as does the cry of both those birds.'

'It is very wild and shy.'

'The only absolutely authentic egg of this species taken as yet (1907) is the one which Mandelli took from the oviduct of a female on the 5th June. The colour is a uniform olive-brown or olive green, sometimes marked with reddish. Texture fine and silky. Shape elliptical. It measures .89 in. × .64 in. and is illustrated in Pl. II.

(8) The Small Hawk Cuckoo (*H. nanus*) is the fifth of this genus. 'Nothing is known so far of the oology of this cuckoo. It is a bird very little known: indeed it is possible that even now we do not know its adult plumage. It has only entered the limits of the Indian Empire in the extreme south of Burma and Tenasserim, and it is also known from Selangor and North Borneo.'

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The genus *Cacomantis* contains, as far as India is concerned, two species of cuckoo, much like, in general appearance, the genus *Cuculus*, but very small, the wing measuring under 5 in., whereas none of the birds hitherto dealt with have wings as small as 5½ in.

(9) The Indian Plaintive Cuckoo (*Cacomantis merulinus passerinus*) ranges through the greater part of India, from the Himalaya to Ceylon inclusive, rare in the North-West, and although found on Mount Abu, wanting elsewhere throughout Rajputana and the Indus plains. It occurs in the Himalaya from Simla to Sikhim, ascending the hills to the westwards up to about 9,000 ft. according to Jerdon, and its range extends to Eastern Bengal where it meets the next species. In the Peninsula of India it is chiefly found in forest regions, and is most abundant in Bengal, Orissa, the wooded tracts of the latter, and on the hills in the neighbourhood of the Malabar coast (Blanford).' It is recorded from Abbottabad (xxiv, 595).

Its call is a plaintive *we-whew, we-whew*, and it is noisy in the breeding season, being much heard on moonlight nights. It is a shy bird.

It was Miss Cockburn who established the identity of the egg, which is illustrated in Pl. II in two colours, blue and speckled white. Size (average) being .72 in. × .52 in. In his Additional Cuckoo Notes (xvii, 885 et seq.) Mr. Stuart Baker adds much to the oology of this bird. There appear to be several types of egg. The bird is parasitic chiefly on the Tailor Bird, also on the Ashy Wren Warbler, the Small Minivet and others. In these same Notes Professor Burnett of Hyderabad contributes much interesting matter. Also B. B. Osmaston in xxiv, 361-2.

At xvii, 371, it is recorded that the eggs of this cuckoo were found in the nests of a babbler and a shrike. 'This is curious as the eggs of both these birds are much larger than those of the cuckoo, and it is an almost invariable rule for cuckoos to choose birds which lay eggs smaller than they do or, at least, as small.'

(10) The Rufous Bellied Cuckoo (*C. m. querulus*) is the Eastern representative of the Plaintive Cuckoo and is found all over Eastern Bengal, Assam and Burma. It is resident in all these provinces, and is very common. In habits etc. it is like the Plaintive Cuckoo and its voice resembles that of that bird, but is less seldom used, and perhaps less high pitched and shrill.

Information as to its breeding is scanty and very conflicting. The egg is *possibly* like large eggs of the Indian Wren Warbler and of the Indian Tailor Bird. The greenish egg with large blotches, believed to be that of this bird, is illustrated in Pl. III opp. p. 680 of xvii.

Of the genus *Penthoceryx* we have three species, of which one is of Ceylon only and another peculiar to Malay and the East.

(11) The Banded Bay Cuckoo (*Penthoceryx sonneratii sonneratii*) is common in Ceylon and the south of India, but becomes much more rare further north, especially to the west. It extends through Bengal to Assam and so through Burma, Malay Peninsula, Sumatra, Borneo and Java.

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The egg has been seldom obtained. In 1907 Mr. J. Davidson had the only oviduct egg of this species in existence. The egg illustrated in Pl. III was supplied by Mr. Davidson and said by him to closely resemble the oviduct egg. Colour brownish-pink ground, speckled and freckled with reddish brown, texture and shape as in *canorus*. Average size .76 in. × .63 in.

The bird has two distinct cries—one exactly like that of the Indian Cuckoo (No. 4 *ante*) except in a much higher key; the other like that of the Indian Plaintive Cuckoo except that it *always* stops in the middle of the second or third repetition.

Of the genus *Chalcococcyx* there are three within our limits but one of these, the Malay Violet Cuckoo, need not be considered in this paper.

(12) The Violet Cuckoo (*Chalcococcyx xanthorynchus xanthorynchus*) is confined to the east of the Empire and found throughout Assam, especially Cachar and Dibrugarh, the whole of Burma and Malay Peninsula, Sumatra, Borneo, Java, Andamans, Nicobars.

There is practically nothing on record about its habits, voice, etc. The bird is not very shy, but keeps much to the tops of lofty trees on high ground. They are very fond of haunting the tops of lofty silk cotton trees (*Bombax*) when in flower; and in this are in company with a number of other species of birds, also squirrels, monkeys, and countless insects.

The male of the species has the upper parts glossed with metallic violet. The female is parasitic on the Nepal Babbler, and doubtless other small birds of that type.

The eggs are probably much like those of the Banded Bay Cuckoo but with general tone far more pink and less brown. 'The eggs are very large *for cuckoo's eggs*, in proportion to the size of the bird, the bulk being as much as it is in the eggs of *poliocephalus* (3) and *saturatus* (2) birds of, perhaps, between three and four times the cubic contents of the tiny Emerald Cuckoo. The eggs of both species are illustrated in Pl. III. Size .75 in. × .56 in. to .78 in. × .63 in.

(13) The Emerald Cuckoo (*C. maculatus*) has the upper parts glossed with metallic green and has much the same range as the former bird, but it extends further west, having been recorded as far as Kumaon. It also straggles into Eastern Bengal. 'This cuckoo has a comparatively large foot, hence its activity when in trees.'

Both the species are parasitic on Babblers, and of course on other species also. Reference should also be made to Stuart Baker, xviii, 275 and 915; and Inglis, xviii, 681.

Now we meet a very remarkable bird, to be found if diligently sought for but very seldom recognized. This is the Drongo Cuckoo (*Surniculus*) of which we have three species of the genus; the Malay, the Indian, and the Ceylon.

The two latter divide India between them, the habitat of the first being Upper India, Assam, Burma, Siam, Hainan, China; and of the second Ceylon, Travancore and the West Coast up to Karwar.

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(14) THE INDIAN DRONGO CUCKOO (*Surniculus lugubris dicruroides*) may be considered with the Ceylon Drongo Cuckoo (*S. l. stewarti*) as they are no doubt very similar in size, habits, and appearance, having been only of recent years distinguished the one from the other.

Of this bird Mr. Stuart Baker writes (xvii, 687) in 1907: 'There is nothing absolutely authentic on record about this Cuckoo's eggs' and 'so close is its resemblance to the Common Black Drongo that it escapes observation', 'its flight is varied, sometimes dipping much as it is with the King Crows, at others quick and direct. Its call is a most human whistle of six notes running up in scale, and this it gives frequent utterance to both by day and on moonlight nights. I have also heard one utter a double plaintive note like *whee-whip*, much like a call indulged in by the King Crow in the breeding season. Indeed, had I not been standing close under the cuckoo as it was in the act of calling, I should have thought it was the Drongo.'

The King Crow, a masterful champion, valiant and ever vigilant, is one of the best known birds in India; for who does not know the black, fork-tailed bullies which sit on the telegraph wires and make graceful sallies into the air after the flies and insects on which they feed?

Let us consult Mr. Douglas Dewar in 'Bombay Ducks'. 'Why the King Crow? Needless to state, this royal bird has no connexion with the vulgar, plebeian crow.' . . . 'Far more appropriate is one of the native names for the bird, the Kotwal; which, being interpreted, is the head officer of the chief police station. Everyone who is acquainted on the one hand with the methods of the Indian police, and on the other, with the habits of the King Crow, will appreciate the title—he takes upon himself the burden of keeping in order the whole bird population of India. His office is no sinecure, for although the fowls of the air are in general law-abiding folk, there are not wanting among them vagabonds, egg-stealers, nest-breakers, and other criminals' and much more that is most entertaining and instructive, so you really should possess the book referred to by this author, who is also a notable contributor to our *Journal*.

As to our Drongo Cuckoo he writes in the same book. '*Surniculus lugubris* is, perhaps the most wonderful example of mimicry in nature. It has adopted the dress of the Drongo (also his voice and flight). It is black all over and has a forked tail. It is said to be a very uncommon cuckoo. I do not know if I have ever seen a live species or not, for I cannot distinguish it from a King Crow. I am not ashamed of this admission: for the King Crow is in this respect no better off than I am. I submit that if A cannot distinguish B from his (A's) own brother, it is surely not to be expected that I, a stranger can do so!'

In xxiv, 362, Mr. B. B. Osmaston describes the call of this bird around Maymyo, Burma; also xxiv, 595, may be referred to, where the call is described as mistaken for the whistling of a boy.

The reader can therefore well realize that, in almost whatever part of this country he may be, he has here something worth

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while investigating during his leisure hours. This cuckoo differs from his dupe in that he has 'a few white spots and patches which are hardly noticeable unless the bird is extremely close'.

There are two Crested Cuckoos, the Pied Crested Cuckoo (*Clamator jacobinus*) and the Red-winged Crested Cuckoo (*C. coromandus*).

(15) The Pied Crested Cuckoo (*C. jacobinus*) is found 'practically throughout India and Burma, its eastern boundary being the Irrawaddy river. It does not extend further south in Burma than Upper Pegu, but is common in Ceylon. Outside India it is obtained throughout Southern and Central Africa.'

'Its flight is slow but fairly direct. It haunts indifferently the loftiest of trees, secondary growth and small saplings, or mere scrub jungle. (Often it can be seen jumping in the grass while catching insects.) Its call is a very loud metallic double note, too harsh to be called a whistle. In the early part of the season, before its voice has fully formed, its cries are particularly harsh and disagreeable, and the second note, which should be the same in tone as the first, often goes off at a tangent. Later in the year, though it becomes more noisy than ever, its notes are rather musical.'

In xxxiii, 136-44, will be found an article, with explanatory map, by Mr. Hugh Whistler setting out all that was then (1928-29) known as to the migration of this bird: and asking observers to take notes and report results: the point at issue being whether the Pied Crested Cuckoos which are rains visitors to a huge area in India, winter in Africa. The sole response appears to have been the contribution of Mr. Salim A. Ali, xxxiv, 1071.

This cuckoo is largely parasitic on Bulbuls, also on Laughing Thrushes. An observer saw a Pied Crested Cuckoo deposit its own egg in the nest of a Jungle Babbler and remove one of the Babbler's eggs (xxvii, 894). Two eggs were taken from the nest of the Nepal Babbler, 'the huge Blue Cuckoo's eggs in the tiny nests of *Alcippe* looked very ridiculous, and it seems incredible that the birds could have been so imposed upon as to be induced to hatch them.'

The eggs are well known. 'Dark blue-green. Texture extremely fine and silky, surface smooth. Shape broad, elliptical' and are illustrated in Pl. III. Size, average, .94 in. × .80 in.

(16) The Red-Winged Crested Cuckoo (*C. coromandus*) appears to be a rare bird in India, but with that proviso and other limitations, its habitat seems to be that of the other species. It is common around Maymyo, Burma, and there is a whole page concerning its eggs, food habits, and voice by Mr. B. B. Osmaston in xxiv, 361.

On the morning of the 7th November 1900 a cuckoo of this species 'was caught in the Society's Museum where it had no doubt sought shelter from the unwelcome attention of the crows, which are even quicker than the Members of the Natural History Society to notice a stranger in the neighbourhood.' Only once previously had this species been recorded from any part of the

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Bombay Presidency. That bird was obtained at Savantwadi, and is also in the Society's collection.

The eggs are known. Pale blue-green. Texture as for *jacobinus*. Shape spheroidal. Illustration in Pl. III. Average size 1.06 in. × .90 in.

All the sub-family *Cuculinae* have now been dealt with. The next sub-family is *Phoenicophainae* of which there are 8 genera comprising 21 species. Only the first genus, *Eudynamis*, is parasitic. The others include the Malkohas (9 species), the Sirkeer Cuckoos (3 species) and the Crow Pheasants (7 species).

The Malkohas are green-plumaged birds some of which have red bills and some green bills. Being mostly forest birds they do not attract notice. The Small Green Malkoha is common in South India, while the Large Green-billed Malkoha takes its place in the north-east of India, Bengal and Assam.

Of the Sirkeer Cuckoo, an uncommon and peculiar bird, very little is recorded in the *Journal*. Mr. E. H. Gill (xxix, 299) describes the curious courtship lasting about twenty minutes, when the male bird makes the most of the patchwork effect of his sober plumage.

The Crow Pheasant whose 'deep, sonorous *whoot, whoot, whoot* is one of the most familiar of the sounds which greet the rising sun in India' is well known to almost everyone. Its food is mostly insectivorous but it is said to eat the eggs of other birds; and in localities where there is preservation of game a price is placed on its head. This is probably without proper justification, and the bird may do more good than harm.

(17) The Indian Koel (*Eudynamis scolopaceus scolopaceus*) 'ranges throughout India, Ceylon and Burma, and is unpleasantly common anywhere but in Sind, where it is very rare, and in the West Punjab where it is uncommon. It ascends the Hills up to about 2,500 ft., above which it ceases to persecute. Outside India it extends to Western China, throughout the Malay Archipelago, the Andamans, Laccadives and Flores.'

'Its most common cries are *ko-il*, generally turned into *youre-ill* by Europeans, and continuous shouts of *who-are-you*. By some people this bird has been called the Indian Nightingale (these have probably lived in Sind), and by others its music has been called 'An Introductory Poem to Hades'. It is *always* noisy, but more particularly so by night when it is moonlight. It is everywhere pushing and forward, but, perhaps, more especially so in the compounds of houses containing sick persons.'

The Emperor Baber styled the Koel 'The Nightingale of Hindustan'.

'Its breeding season lasts from the end of April to the end of August. In March it practises its voice and gets its throat into working order, and in September its voice breaks, gradually ceases, and the world has rest for a few cold weather months.'

In India the Koel is mainly parasitic on the Common Crow, and on the Burmese Crow in that country. Occasionally the Jungle Crow is made use of, and its egg has been found in the nest of the Magpie in Burma, and in that of the Common Myna

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in Dibrugarh (Inglis, xviii, 682) and in one peculiar case in that of the Oriole—a very small nest—but that was no doubt a case of emergency (D'Abreu, xxxi, 1032).

A very full and amusing account of the Koel will be found in Mr. Douglas Dewar's 'Birds of the Plains', also in his 'Bombay Ducks' where male and female are illustrated: and in xvii, 765-82, is his very full 'Enquiry into the Parasitic Habits of the Indian Koel' in which he concludes that the young Koel does not eject the crow's eggs or his fellow nestlings—other than by accident; that the incubation period of the Koel's egg is slightly shorter than that of the crow; that the koel undoubtedly destroys, or tries to destroy, some of the crow's eggs it finds in the nest, and given opportunity will destroy all the crow's eggs; that the destruction does not necessarily take place at the same time the koel's egg is laid; that there is no hollow in the back of the koel nestling; that the koel will frequently lay her egg in the crow's nest; and other matters of kindred interest.

His accounts of how he 'played cuckoo' are highly interesting and amusing, and illustrate that 'a nesting bird seems to cast intelligence to the winds. The crows sat upon, and hatched, a fowl's egg, upon a sea-green paddy-bird's egg, and on a golf ball, apparently without noticing that these differed in any way from their own eggs. Again, the addition or subtraction of an egg or two was not noticed. Further, when I introduced a young koel into a nest containing eggs only, the parent birds at once set to work to feed the young koel as though they were quite accustomed to young birds being thus introduced into the nest!' Experiments of others in the same direction are also cited.

In vol. xxiv, 595, Mr. Hugh Whistler also contributes as to incubation and removal of crow's eggs at time of laying.

Mr. Salim A. Ali, an accurate observer who contributes valuable articles to our *Journal*, also (xxxiv, 1067) 'played cuckoo' with regard to egg mimicry of *canorus* and one of his experiments was cut short by a female koel which swallowed all the four eggs in the nest in as many seconds!

Ordinarily not more than two koel's eggs are found in a crow's nest, but on occasion four or more are found; and in one instance (xxxv, 458) eleven eggs are recorded. These are cases of two or more birds depositing their eggs in the same nest; and this can be known by the different types of egg found in such cases: but Mr. Dewar says (xvii, 782) that a great deal of variation is displayed in the same clutch. 'In one clutch of four eggs each differed so greatly from the others that, unless I had myself taken all four eggs out of the same nest, I should not have believed that one bird could have laid them.' Can it have been that more than one bird laid those eggs?

With the exception of examination (for purposes of 'distribution') of the many lists of birds from various localities in the Indian Empire which have been contributed from time to time by Members of the Society, I have carefully searched the past fifty years of the *Journal* for material, and think that nothing of importance has been omitted in this effort to bring 'Cuckoo-

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Lore' up to date for the information and entertainment of readers.

EDITOR'S NOTE.—The cost of back numbers of the *Journal* has been greatly reduced; so those referred to in this article, vol. xvii, Nos. 1-4 (which contain the egg Plates), and most of the others, can be obtained at one rupee each.

In connection with the study of Ornithology the Editors invite attention to the several series which have appeared in recent years in the *Journal* of the Society such as: The Study of Indian Birds by Mr. Hugh Whistler; and The Birds of Prey of the Punjab by Mr. C. H. Donald.

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THE ORNITHOLOGY OF TRAVANCORE AND COCHIN.

BY

SĀLIM ALI.

With Notes by HUGH WHISTLER.

PART III.

(*With two plates*).

(*Continued from page* 92 *of this volume*).

FAMILY: TURDIDÆ.

Brachypteryx major albiventris (Blanford). The White-bellied Shortwing.

Specimens collected: 115 [♂] imm. 20-1-33 Mūnnār 5,000 ft.

Elsewhere not noted. Possibly overlooked or confused with *Muscicapula pallipes*.

In the Trivandrum Museum I have seen the following Travancore skins: o? 5-3-03 Chemunji; o? 5-97 Devikolam. William Davison obtained four specimens 'in late December or early January on the Chimpani Hills dividing Travancore territory from Tinnevelly District.' (*Ibis*, 1888, pp. 146-47.)

Colours of bare parts: Iris bright khaki brown; bill brownish-black; mouth pale pinkish-grey; legs, feet and claws horny-brown.

[I have examined the following specimens in the British Museum Collection: o? 18-4-77, o? 16-4-80 Colathoorpolay, Patnas 3,800 ft. and 4,000 ft. (Bourdillon); ♀ ?-5-97 Devikolam (A. H. Nair); ♀ 16-4-79 Mynall 4,000 ft. (Bourdillon); ♀ 11-6-77, ♀ 21-6-77, ♂ 23-6-77 Kodaikanal 7,000 ft., Pālnis (Fairbank); ♂ *Type* Pālnis (Fairbank); ♂ 24-5-77 Pillar Rocks Grove 7,000 ft., Pālnis (Fairbank). No material is available for plumage study.—H. W.]

The specimen—a young bird with very imperfectly ossified skull—was shot on a densely scrubbed hillside on the town outskirts in the same biotope as *Tarsiger brunnea*, *Ochromela nigrorufa* and *Pitta brachyura*. It was solitary.

According to Ferguson the White-bellied Shortwing is found throughout the Travancore hills in dense forest undergrowth at elevations over 3,000 ft.

In the Palni Hills, Fairbank (*S.F.*, v, 402) writes: 'I obtained one pair in 1867 with their nest and two eggs all in the Kodai Grove. Described by Blanford in *P.Z.S.* and figured in Gould's *Birds of Asia*. I found them in the same locality again in May and June this year. They live in the thickets of the Kodaikanal and I obtained one in another grove at the Pillar Rocks. As May is their nesting season and they indulge in a sweet song in the evening twilight it is not difficult to trace them, though it is difficult to see them far enough away to shoot without spoiling them. Sometimes they come out of the thickets at dusk and sit by a bank or on the roadside and sing. Their song is not so loud or so varied as that of *Merula simillima*, but similar in style and in the quality of its tone.'

This bird is not found in Ceylon.

Breeding: Terry (*S.F.*, x. 473) also met with it in the big shola [Vembadi?] at Kodaikanal. He took c/2 fresh eggs on 7 June and c/2 fresh 'later', and gives a description of the nests.

From the accounts it appears that April, May and June are the breeding months in the Pālnis. Unless they also breed considerably later in Travancore, it is difficult to account for the Survey specimen having a 'very soft skull' as late as the 3rd week of January. In plumage, however, this specimen is indistinguishable from the adult. The only clutch from this area in Mr. Stuart Baker's collection was taken by T. F. Bourdillon on 7 March (*Nidification*, ii, 4).

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Tarsiger brunnea brunnea (Hodgson). The Indian Blue Chat.

Specimens collected: 109 ♂ 18-1-33, 116 ♀ imm. 20-1-33 Mūnnār 5,000 ft.; 379 ♂ 28-2-33 Kūmili 3,000 ft.; 972 ♂ imm. 13-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Sānthanpāra (3,500 ft.); Peermade (3,200 ft.); Camp Derāmalāi (3,000 ft.); Balamore Estate (2,000 ft.—25 and 26 April !).

Colours of bare parts: Iris dark brown; bill blackish-brown, gape and chin pale brownish flesh colour; mouth greyish-pink; legs, feet and claws brownish flesh colour.

[The Survey specimens measure:

	Bill.[1]	Wing.	Tail.
3 ♂♂	15	74-78	46-51 mm.
1 ♀	15.5	73	46.5 mm.

Other specimens examined:

B. M. Collection: ♂ 19-11-74, ♀ 19-1-75 Mynall, Travancore (Bourdillon).

The plumages of this species are as follows:

Juvenile male: The whole upper plumage including sides of the head and the lesser and median coverts dark olive-brown, the feathers faintly mottled with dark brown and fulvous; remainder of wings and tail as in the adult male but duller, the greater coverts edged with fulvous; whole lower plumage fulvous, becoming albescent on the centre of the abdomen and vent, the feathers edged with dark brown, lightly on the chin, throat and undertail coverts, very heavily on the breast and flanks.

Juvenile female resembles the juvenile male except that the upper tail coverts are washed with rufous and the wings and tail are similar to those of the adult female.

The post-juvenal moult is complete with the exception of the primary and outer greater coverts, the primaries, secondaries and tertiaries and probably the tail which are retained till the following autumn. It presumably takes place about August-September.

The first winter plumage of the male has two phases which may be considered in the light of 'retarded' and 'progressive' plumages as recently discussed by Mayr (*Amer. Mus. Novitates*, No. 666, 7 October 1933). The more complete or 'progressive' phase is exactly like the adult male plumage, save for the unmoulted portions of the juvenile plumage. The other phase is very different in that the forehead and lores are fulvous, the top of the head, hindneck and upper mantle are brown with a fulvous and blue-grey wash; the white supercilium and black facial band are absent, being replaced by mixed brown and fulvous. The chestnut of the lower parts is paler, becoming whitish on the chin and throat. This phase would I suppose be considered as 'retarded' by Mr. Mayr. At the same time it must be remembered that it may equally be regarded as a step towards the formation of a definite first-year plumage quite distinct from the juvenile and adult plumages. Whether males in this second phase would breed it is not fully clear. They would presumably do so as the birds of the 'progressive' phase certainly breed in it without the interposition of a spring moult. If, however, the species is slowly developing a third or pre-adult plumage as suggested, it may well also be developing a spring moult to ensure that the fully adult plumage is assumed for the breeding season.

The adults have a complete post-nuptial moult about August and September. There is no spring moult and the summer and winter plumages are alike.—H. W.]

The Indian Blue Chat is a fairly common winter visitor to all the Travancore and Cochin hills. I met it between 2,000 and 5,000 ft. elevation, the last date being 26 April. It may, however, be found somewhat later than this, and a specimen in the Trivandrum Museum obtained by Ferguson (and referred to in his notes *J.B.N.H.S.*, xv, 261) is labelled: ♂ May 1891 High Range. By the end of April most birds had left.

These chats frequent evergreen undergrowth, preferably of seedlings, but I also found them partial to *Rubus* and *Pandanus* thickets especially where lining forest nullahs or hill ravines. They were commonly met with under coffee

[1] All bill measurements are from skull unless specified.

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bushes and cardamom plants. They are usually found singly, flitting about the undergrowth, alighting on the ground and hopping along easily and swiftly in search of insects. A feeble monosyllabic squeak is repeated about once a second, usually punctuated at intervals by 'chr-r-r' or 'chick-chick' like *Alseonax*. The bird similarly jerks its tail up when uttering these sounds.

Kinloch considered the Blue Chat somewhat rare in the Nelliampathies. Fairbank (*S.F.*, v) does not record it in his Pālnis list and the species has apparently not yet been met in those hills.

It is a winter visitor also to the Ceylon hills being found there from the middle of October to April.

Specimens No. 972 (13 December) and 116 (20 January) were immature with imperfectly ossified skulls. The *Fauna* (ii, 14) gives the breeding season from Kashmir to Sikkim as May, June and early July. Unless, therefore some birds also breed considerably later, it would seem that the process of ossification is unusually retarded in this species.

Saxicola caprata atrata Blyth. The South Indian Stone-Chat.

Specimens collected: 74 ♀ 12-1-33 Marāiyūr 3,500 ft.; 110 ♂ 18-1-33 Mūnnār 5,000 ft.; 150 ♂ 25-1-33 Sānthanpāra. 3,500 ft.; 331 ♂, 332 ♀ 28-2-33 Peermade 3,200 ft.

Elsewhere noted at: Camp Derāmalāi (3,000 ft.); Wadakkāncheri (400 ft.)- doubtful!

Noted as absent at Thattākād (200 ft.) and Kūmili (? 3,000 ft.).

Colours of bare parts: Iris brown; bill, legs, feet and claws brownish-black; mouth yellowish-pink, greyish-pink or brownish-pink presumably varying with age.

[Additional specimens examined:

B.M. Coll.: ♂ -2-80 Peermade (Bourdillon); 2 ♂♂ (Fry); 2 ♂♂ June, Kodaikanal, Pālnis (Fairbank).

Sparrow Coll.: ♂ 21-3-14 Cardamom Hills (Sparrow).

B.N.H.S. Coll.: ♂ 25-5-93, ♂ 4-3-94 Kodaikanal (Cook); ♂ 3-12-00 Pambanam; ♂ 28-12-00 Stagbrook; ♀ 1-1-01 no locality; ♀ 25-1-01 Devicolum.

Measurements:

	Bill.	Wing.	Tail.
13 ♂♂	14.5-18	72-78.5	53-59.5 mm.
4 ♀♀	15-16.5	70-75.5	51-54 mm.

In the Eastern Ghats Report (*J.B.N.H.S.*, xxxvi, 69). I admitted the race *S. c. burmanica* with a good deal of hesitation, the difference between it and the typical race ((Luzon) being merely one of measurements and that very limited. Since then I have been enabled to examine extra specimens including series from Khandala and the Biligirirangan Hills through the kindness of Mr. Humayun Abdulali and Mr. Ralph Morris respectively. These series show that there is complete intergrading between the large *atrata* of the S.-W. hill ranges and the small *burmanica* type obtained in the Eastern Ghats, which destroys the very small margin which I showed to exist between the Eastern Ghats series and the typical series. Dr. Ticehurst also informs me that a series received by him from Burma also shows that Burmese birds cannot be separated from the typical race. To sum up the effect of the specimens now measured by me (excluding the Biligirirangan series which on the whole are closer to *atrata*):

	Bill.	Wing.
17 ♂♂ (E. Ghāts, Hyderābād, Nāgpūr, Malabar Coast)	13.5-15	67-76.5 mm.
19 ♂♂ (Burma)	13.5-15	66-73 mm.
11 ♂♂ (Luzon, Timor, Lombock etc.)	14-15	64-75 mm.

On these measurements there is obviously no room to recognise two races, even though it be admitted that if individual specimens are examined the Luzon series tend to average larger in the same proportion as Ceylon birds

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1. Shifting Camp across Periyār Lake, ca. 3,000 ft.

(Undulating grassy hilltops in background, favourite haunt of *Schoenicola*. Partially submerged dead tree-trunks provide nesting sites to Mynahs of several species and foraging bases to *Artamus fuscus*, *Phalacrocorax*, *Haliastur* and other birds.)



Photos by author.

2. A friendly visitor to the collecting camp at Arāmboli. The Tailor Bird (*Orthotomus s. fulicata*) ♀.

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compared with those of the Nilgiris. These average differences are not worth subspecific recognition. The new specimens now available further confirm that the females of both *atrata* and *caprata* are considerably darker than females of the northern *bicolor* and more heavily streaked on the underparts.

The juvenile plumage of *atrata* is much darker than that of *bicolor*. Compared with the latter the upper parts are a darker sooty-brown, with the pale spotting much reduced; the chin and throat are dark sooty-brown with pale central spots. The white spot on the inner coverts is much enlarged.

The adult plumage is assumed at the post-juvenal moult with the exception of the primaries and their coverts, the secondaries and outer greater coverts and tail, which are retained from the juvenile plumage apparently to the following autumn. In this first winter plumage the black body feathers may be largely fringed with brown. There is no pre-nuptial moult and the complete post-nuptial moult starts as early as May and June.—H. W.]

The Stone-chat or Pied Bush-chat is not an abundant species in the Travancore-Cochin area. It is mostly confined to the hills where I came across it up to 6,500 ft. elevation (Kūmarikkāi Malāi, above Marāiyūr). Of all the localities it was perhaps commonest at Mūnnār (5,000 ft.) with Peermade a good second, though even here its numbers could stand no comparison with its abundance in the Nilgiris. Camp Derāmalāi was the southernmost point at which the species was noted.

The birds frequent open grassy hillsides sparsely interspersed with dwarf date palms or straggly Nelli (*Phyllanthus emblica*) trees, and usually keep in pairs.

On the Pālni Hills, Terry (*S.F.*, x, 476) considered it one of the commonest birds and he took several nests there.

In Ceyon this chat is a resident species, but local and restricted to elevations above 3,500 ft.

Breeding: In specimen No. 110 (18 January) the testes had commenced developing and measured ca. 3×2 mm. Males at this time were singing from exposed perches, a behaviour indicative of the approach of the breeding season. The gonads of a pair, Nos. 331 and 332, on 22 February showed that they were ready to breed: the testes measured 6×4 mm. while the ovarian follicles were about 1 mm. in diameter.

The above confirms the statement in the Eastern Ghats Report (*J.B.N.H.S.*, xxxvi, 70) that the breeding season in this area commences as early as February. It is said to continue till the end of May, but that most nests contain fresh eggs about the end of March and the beginning of April.

Cyanosylvia svecia (Linnaeus) subspecies? The Bluethroat.

Specimens not obtained.

At Thattākād (200 ft.) I saw the Bluethroat on several occasions in among water-logged paddy fields amidst forest. A specimen shot could not be recovered. It was not abundant here, neither was it noted elsewhere in Travancore.

The species has apparently not been recorded from this area before, though Hume (*S.F.*, x, 390) states that in the Wynaad it is common.

Saxicoloides fulicata fulicata (Linn.). The Indian Black-backed Robin.

Specimens collected: 243 ♂ 8-2-23 Thattākād 200 ft.; 601 ♂ 16-4-33, 607 ♂ 17-4-33, 625 ♂ juv. 19-4-33 Arāmboli 250 ft.; 921 ♀ 29-11-33 Wadakkāncheri 400 ft.; 935 ♀ 3-12-33 Nemmāra 300 ft.; 1056 ♂, 1057 ♂, 1058 ♀, 1059 ♂ 1-11-34, 1060 ♀, 1061 ♀, 1062 ♀, 1063 ♂ 2-11-34 Perūmbāvūr 600 ft.

Elsewhere noted at: Trichūr, Karūpadanna (ca. S.L.).

Colours of bare parts: *Adult*: Iris brown, bill, legs, feet and claws brownish-black; mouth blackish-brown, slaty-pink or greyish-pink varying with age (?). *Juvenile*: Iris olive-brown; legs and feet greyish-black; claws black; mouth bright yellow.

[The only other specimen from this area seen is in the British Museum ♂ -10-69, Pālnis (Hume Collection).

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
12 ♂♂	15-17	73-79	60-67	25-27 mm.
9 ♀♀	15-15.5	69.5-75	59.5-62.5	25.5-26 mm.

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Juvenile plumage (♂ No. 625): Upper plumage chocolate-brown, the bases of the feathers darker, the earcoverts streaked with rufous brown; wings and their coverts dark chocolate-brown, the feathers edged with rufous brown; tail black; lower plumage dark chocolate-brown, each feather of the chin, throat and breast with a fulvous brown subterminal spot giving a mottled appearance which dies away on the abdomen; lower tail-coverts chestnut.

I am not able to make out clearly whether the post-juvenal moult is complete. In nearly all specimens the primaries and their coverts appear to be faded and contrast with the rest of the wing, but I am not satisfied whether these feathers start paler and bleach more rapidly or whether they are remains of the juvenile plumage.

There is no pre-nuptial moult and the complete post-nuptial moult normally takes place from August to October in Southern India generally.

In the Eastern Ghats Survey (*J.B.N.H.S.*, xxxvi, 72) I remarked on the fact that the only female of this species seen from Ceylon, in the British Museum Collection, was quite different to Peninsula specimens, being very dark, almost black in colour and pointed out that if this difference was found to be constant it would necessitate a revision of names. Since then the Director of the Colombo Museum has very kindly sent me on loan a series of 7 specimens collected in Ceylon. The two females in this series agree with the British Museum specimen in colour, the single juvenile is just as dark, and the males have rather less chestnut on the vent region as compared with Peninsular birds, both sexes also having rather heavier, though not longer bills. It is evident, therefore, that Ceylon birds must be kept separate from those of the Peninsula and to them the name *fulicata* applies. For the southern peninsular race I think we may use *Œnanthe ptymatura* of Vieillot. The *Fauna* (vol. vii, p. 112) gives the type locality for this as Ceylon, making the name a true synonym of *Saxicoloides f. fulicata*, but this is not quite correct. *Œnanthe ptymatura* Vieillot, Nouv. Dict. d'Hist. Nat. xxi (1818), p.435 was based on Le Vaillant Hist. Nat. Oiseaux Afrique (1805), pl. 188, fig. 1, representing Le Traquet à queue striée. In the text it was stated 'L'espèce de ce traquet habite les buissons et les bois de mimosa du pays caffre' but there is no South African bird which can be identified with the plate. As, however, the author goes on to say that this Traquet 'se trouve aussi dans Le Bengale' and as the plate certainly agrees with the male of the Indian Robin, it is evident that this species is meant. The locality 'Bengale' cannot, however, be literally correct as Bengal birds belong to the brown-backed race and the plate most manifestly represents the black-backed form. I think therefore we are justified in regarding the word Bengal as used in the old sense as a synonym for India and restricting the type-locality to Pondicherry, then already a French possession in the south, in order to avoid the creation of a new name.

As regards our Travancore series, No. 935 is as dark as the Ceylon females and No. 1058 is nearly as dark. The other females, however, agree with South Indian birds; the males have the chestnut patch rather larger than in Ceylon birds, whilst the beak in both sexes agrees with Peninsular birds. The series is in fact exactly intermediate and its inclusion with either race is a matter of opinion. On the whole I think it is best included with the typical race.—H. W.]

The distribution of the Indian Robin in the Travancore-Cochin area is governed entirely by the presence or otherwise of dry stony country with short grass and sparse thorn and cactus bushes, such as generally obtains on the Deccan Plateau and in the Madras districts across the eastern boundary of the States. Add to this a sprinkling of *Borassus* palms standing on bunds or about dry paddy fields hedged with patches of Lantana here and there, and you have the ideal environment for this species. On a casual acquaintance Thattākād appeared a most unlikely spot to find the Robin in. A few miles down the Periyār River, however, a patch was struck which conformed with most of its requirements and here the species immediately appeared. As Ferguson observes, it is not a common bird in Travancore but I found it decidedly more so in Cochin. Wherever its ecological requirements are satisfied—chiefly in the low country—small numbers are usually to be met. Ferguson has seen it at 2,000 ft. elevation in the hills during the dry season.

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Fairbank (*S.F.*, v, p. 406) records it from the eastern base of the Pālni Hills.

This Robin is a common resident in Ceylon.

Breeding: On 25 December (Karūpadanna, Cochin) a pair were observed building in a pocket in a laterite roadside cutting near the Travellers' Bungalow. Both birds were bringing building material—hair, rootlets, cocoanut fibre, etc. —more or less alternately at intervals of 30 seconds to 1½ minutes. They were most active till about 10-30 in the forenoon. The full clutch of 3 eggs was completed on 30 December. During the heat of the day the nest was mostly left unattended, but the female brooded at night. The male evidently does not share in the incubation though later he helps to feed the young.

In specimens No. 243 (8 February) and 601 (16 April) the testes measured 4×3 and 5×4 mm. respectively, while No. 607 (17 April) with testes 6×3 appeared to have a nest in the neighbourhood. No. 625 (19 April) was in juvenile plumage with imperfectly ossified skull.

The breeding season obviously commences considerably earlier in this area than has been recorded from elsewhere, and continues at least till about the middle of April, if not later.

Copsychus saularis ceylonensis Sclater. The Magpie-Robin.

Specimens collected: 31 ♀ 7-1-33 Marāiyūr 3,500 ft.; 705 ♂ 22-7-33 Trivandrum ca. 100 ft.; 759 ♂ 31-7-33 (Akkūlam 150 ft.); 768 ♂ 2-8-33 (Marūthānkūzhi ca. 50 ft.); 793 ♂ 5-8-33 (Poojappūra 150 ft.); 812 ♀ 8-8-33 (Makūnnimalai 800 ft.) Trivandrum Environs; 923 ♂ 30-11-33 Wadakkancheri 400 ft.; 1028 ♀ 27-12-33 Karūpadanna ca. S.L.

Elsewhere noted at: Thattākād (200 ft.), Kottāyam (ca. S.L.); Kūmili (3,000 ft.), Rājampāra (1,350 ft.), Tenmalāi (500 ft.); Arāmboli (250 ft.); at base of Ashāmbū Hills below Balamore Estate (ca. 500 ft.), Chālakūdi, Kūriārkūtti (1,600 ft.), Nemmāra (300 ft.), Trichūr, Ernakūlam.

Apparently it was absent at Pādagiri (3,000 ft.—Nelliampathies), Peermade (3,200 ft.) and curiously enough also at Cape Comorin.

Colours of bare parts: Iris brown; bill horny-black; mouth yellowish-flesh to slaty-pink; legs, feet and claws horny-brown.

[Five males from Travancore in the British Museum are without data. The Survey specimens measure as follows:

	Bill.	Wing.	Tail.
5 ♂♂	21-24	97.5-104	81.5-90 mm.
3 ♀♀	21-21.5	92-97	80-81 mm.

In writing on the Magpie Robin in the Eastern Ghats Survey Report, I was hampered by the fact that the British Museum possessed no females from Travancore. This has been remedied by the present Surveys and it is now satisfactorily established that the Ceylon race certainly extends throughout Travancore and Cochin, and I am inclined to attribute to it also birds from the Nilgiris, Wynaad and Bangalore.

The differences in the amount of black on the third and fourth outer tail feathers and in the size of bill usually attributed to this race do not appear to me to be constant, but the female is certainly darker both above and below than in the typical race: No. 1028 is so dark that had it not been satisfactorily sexed by dissection one would have hesitated to which sex to attribute it.

The juvenile ♂ No. 705 (in squamated plumage) is quite indistinguishable, however, from similar specimens from the Punjab and the Duars.

The post-juvenal moult in this species is complete. There is no pre-nuptial moult and the post-nuptial moult is complete. The moult appears to be remarkable at all ages for the sudden completeness with which the tail is shed, so that birds with a short stub tail are often seen in autumn. The post-nuptial moult in Travancore takes place about August.—H. W.]

The Magpie Robin is a fairly common species in Travancore and Cochin. It was met with by the Surveys more or less throughout the low country and also patchily and sparsely in the hills up to 3,500 ft. In the Eastern Ghats Report (*J.B.N.H.S.*, xxxvi, 74) through a slip it is stated that in Travancore

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Ferguson regarded it as more particularly a bird of the *hills*. Actually Ferguson described it (*J.B.N.H.S.*, xv, 466) as '. . . essentially a bird of the *plains*'.

It inhabits secondary jungle and scrub country in the neighbourhood of cultivation and human habitations, being especially partial to the cashew and fruit gardens about homesteads along the backwaters.

Between 10 November and upto 8 December the males were observed as practically silent, the only notes then uttered being a prolonged and somewhat plaintive *swee-ee* and subdued harsh *chr-r*, *chr-r*, etc. The birds were also inordinately shy and kept mostly to undergrowth. On the latter date for the first time crude attempts at song were heard. From now on 'rudimentary' song or 'singing practice' was more and more commonly heard. By the middle of January individual males were singing full-throatedly from tree-tops both early morning and evening, but this had as yet not become general. The rapid growth and development of song thereafter, however, was marked, and by 15 February—about which date males were puffing and strutting about and chasing off rivals—it was heard on all sides.

In the Pālni Hills, Fairbank (*S.F.*, v, 406) found the Magpie Robin from the base up to 5,000 ft., but Terry (*S.F.*, x, 476) only saw it far down the slopes and did not think it ascended to any height.

It is common throughout Ceylon up to 5,500 ft.

Breeding: Ferguson (*J.B.N.H.S.*, xv, 466) says it breeds in February and March. The Surveys were unable to obtain any direct evidence on this point, but the behaviour of the cocks from about the middle of February onward certainly tends to confirm his statement. That it continues to breed longer is suggested by four of the specimens collected in July and August which were undergoing complete post-nuptial moult.

Kittacincla malabarica malabarica (Scopoli). The Shāma.

Specimen collected: 880 ♀ 18-11-33 Kūriārkūtti 1,600 ft.

Elsewhere not noted, but I have seen a specimen in the Trivandrum Museum labelled: ♀ 1-8-(70?) Kūttyāni.

Colours of bare parts: Iris brown; bill dark horny-brown; mouth pink; legs and feet pinkish flesh colour; claws dusky.

[Two specimens from Travancore (Biddulph) in the British Museum have no more precise data.

Measurements:

	Bill.	Wing.	Tail.
2 ♂♂	19.5-20	89-94	175-176 mm.
1 ♀	20	90.5	127.5 mm.

This female is of the richly coloured type which approaches the adult male in colouration as opposed to the much duller paler type in which the upper parts, chin and throat are dull ashy grey and the breast and abdomen fulvous rather than chestnut. I do not yet understand the plumages of this species and females are too rare in collections for me to decide whether these differences are due to age or individual variation or even possibly subspecific.—H. W.]

The specimen was one of a pair in dense bamboo and deciduous scrub jungle bordering a drag-path for logs. Several single examples were seen in this facies, once in a mixed bird association. They were silent and extremely shy.

Ferguson (*J.B.N.H.S.*, xv, 466) writes as follows: 'The Shāma is not common in Travancore; it frequents jungle and is decidedly shy. It does not ascend the hills.'

In the Pālni Hills, Fairbank (*S.F.*, v, 406) records hearing one singing at dusk in a thicket at the eastern base of the hills.

In Ceylon the Shāma is generally distributed upto about 3,500 ft.

Breeding: The ovary of the specimen was undeveloped. According to *Nidification* (ii, 106), Stewart found it breeding in Travancore during April.

Turdus simillimus mahrattensis Whistler. The Black-capped Blackbird.

Specimens collected: 89 ♂ 14-1-33 Marāiyūr 3,500 ft.; 104 ♂ 18-1-33 Mūnnār 5,000 ft.; 155 ♂ 25-1-33 Sānthanpāra 3,500 ft.; 271 ♀ 11-2-33

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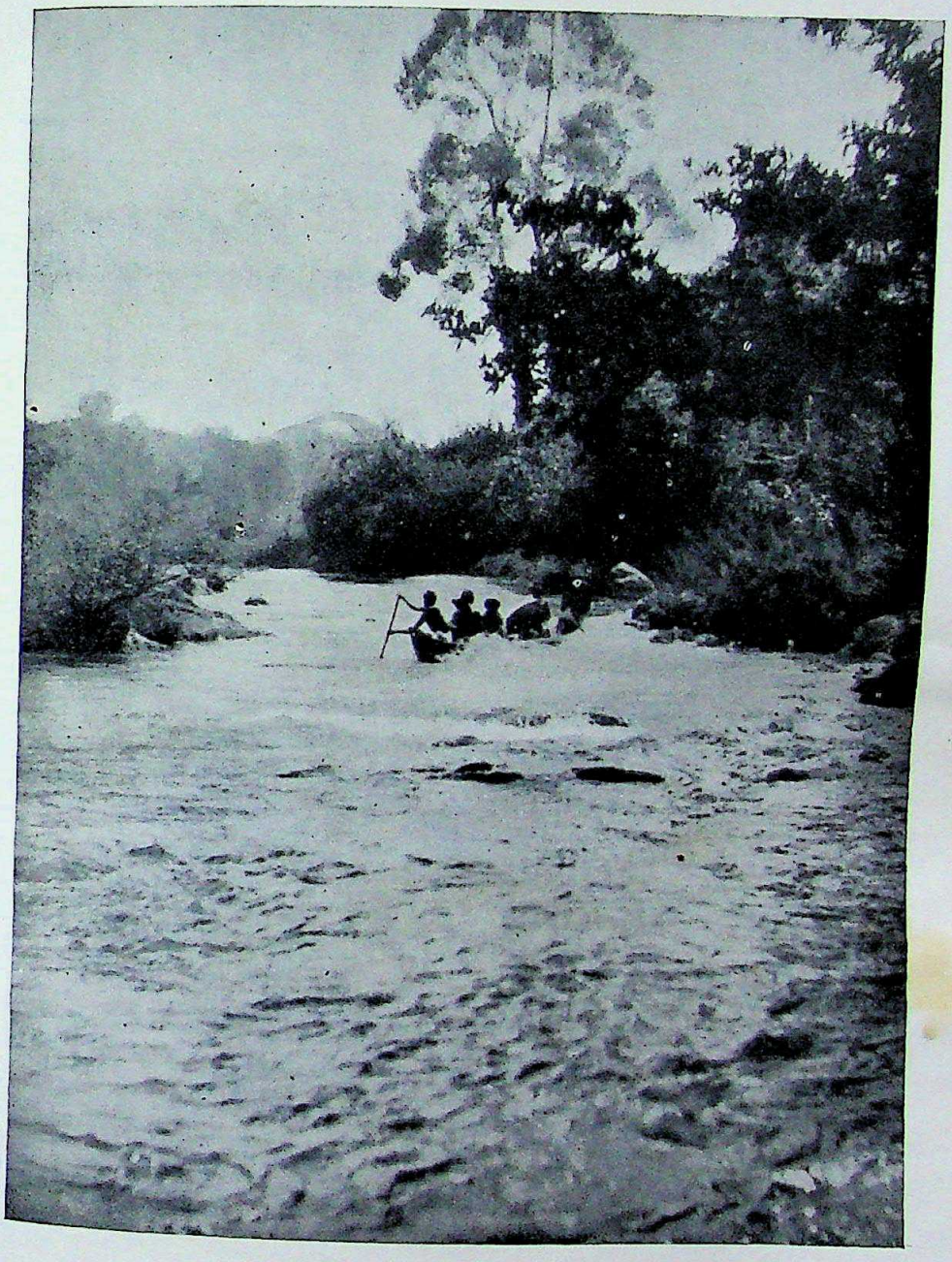


Photo by author.

Shooting the rapids—Periyār River below Thattākād. Ideal bird country on banks.

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Thattākād 200 ft.; 319 ♀, 320 ♂ 21-2-33, 337 ♀ 23-2-33, 353 ♀ 24-2-33 Peermade 3,200 ft.; 883 ♂ 18-11-33 Kūriārkūtti 1,600 ft.; 969 ♀ 12-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Mūthūkūzhi (4,000 ft.—Ashāmbū Hills). This or *bourdilloni*?

Colours of bare parts: Iris hazel brown; eyelids orange; postorbital skin orange-brown, orange-yellow or rich orange corresponding with gape and bill; gape and bill horny-brown with orange patches at gape nostrils and sides, brownish-orange with dusky tips or bright orange with dusky tips; mouth orange-yellow; legs, feet and claws dusky orange-yellow.

[Additional specimen examined : ♂ 14-3-14 Cardamom Hills (Sparrow).

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
5 ad. ♂♂	25-27	126.5-135	92-100	30-33-5 mm.
1 First winter ♂	—	121	89	— mm.
5 ♀♀	26.5-28	122-128.5	86.5-97.5	30-32.5 mm.

In the Eastern Ghats Report (*J.B.N.H.S.*, xxxvi, 75-6) I pointed out the difficulties in connection with these South Indian Blackbirds, and these difficulties chiefly pertain to the area of the Travancore-Cochin Surveys. Either the records are wrong or these Blackbirds cannot all be treated as races of one form. It may be as well first of all to summarise the records under the three of our areas to which they apply (I use here the name *nigripileus* as it occurs in the records.):—

Nelliampathy Hills.

(1) *nigripileus* very common. Generally terrestrial in habits and occurring in pairs, but I have seen large flocks in Lantana (Kinloch, *J.B.N.H.S.*, xxvii, 941).

(2) *bourdilloni*: common on the Lily Downs (4,700 ft.) and there replaces *nigripileus* the common bird of the plateau (Kinloch, *J.B.N.H.S.*, xxix, 565).

Palni Hills.

(1) *simillima*: (a) may be heard any evening in spring in the Kodaikanal and other groves above 4,000 ft. Two specimens (Fairbank, *S.F.*, v, 403).

(b) Very common everywhere in the sholas on the top. They commence breeding in the middle of March and were still breeding when I left in the middle of June (Terry, *S.F.*, x, 474).

(2) *nigripileus*: I found this bird at Pulungi, Pittur and Kukal. At the latter place it was quite common. I am sure it was breeding at the time I was there, May, but I was unable to find a nest (Terry, *loc. cit.*).

(3) *bourdilloni*: ♀ shot from 1 egg on 18 May. ♂ shot from c/2 eggs on 3 June. Details of nests (Terry, *loc. cit.* called *kinnisi*?).

Travancore.

(1) *bourdilloni*: Fairly common on High Range and above 3,500 ft. in the south (Ferguson, *J.B.N.H.S.*, xv, 466). Previously recorded by Bourdillon (*S.F.*, vii, 35) as *kinnisi*.

Mr. Stuart Baker in the new *Fauna* (ii, 125-129) and *Nidification* gives the breeding range of *simillimus* as the higher ranges of the Nilgiris, Brahmagiris and Palnis and of *bourdilloni* as the Palnis, Nelliampathies and Travancore, in both cases from 3,000 ft. upwards. This, if correct, would negative the idea that they are races of each other.

I think part of the difficulty may be removed by considering *nigripileus* (auct.) as a winter visitor. In the Eastern Ghats Report I pointed out that the above records were not substantiated by skins—and one has only to examine a large series of these Blackbirds to realise how variable they are and how difficult it is to be sure of the identifications—though I had found an undoubted male from the Cardamom Hills in Colonel Sparrow's collection, shot on 14 March 1914. The fine series collected by Mr. Sálim Ali now proves that this form does occur down to Travancore. Terry's May record is not incompatible with the bird being a winter migrant. *Tarsiger brunnea* which summers in the Himalayas, lingers down in the Nilgiris until May and it is an earlier breeder than *nigripileus* (auct.) which in Khandala breeds from July

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to September (*Nidification*, ii, 115). In the Nasik Ghats it certainly does not arrive until May (*J.B.N.H.S.*, iv, 239).

If *nigripileus* (auct.) can be proved to breed in our area, then it will be necessary to recognise two species *Merula simillimus* and *M. mahrattensis* of which latter *spencei* will be a race. The difference in wing formula would then be of importance as a means of separating the two species.

The remainder of the difficulty centres in the Palnis. I have only seen six skins from those hills, all in the British Museum. The two birds collected by Terry from his two nests and called *kinnisi* are in the British Museum. These are certainly *bourdilloni* as is a third bird collected by Terry on 1-6-83 with c/3 eggs which is in Dr. C. B. Ticehurst's collection. With it is another skin, unlabelled but evidently of the same batch. These two birds in Dr. Ticehurst's collection probably represent Terry's supposed *simillimus*. The other two specimens collected by Fairbank (Kodaikanal and Shemiganur) and now in the British Museum are not conclusive. They appear intermediate between *simillimus* and *bourdilloni* and suggest that the whole difficulty in the Palnis arises from its being an intermediate area. The final solution of the whole matter must be left to the field naturalist on the spot.—H. W.]

Since all the Blackbirds collected by the Surveys in Travancore and Cochin belong to this form, I assume that my field notes also relate to the same bird. It must be noted, however, that both Bourdillon and Ferguson met only the race *bourdilloni* in Travancore and that Kinloch also records the latter from the Nelliampathies, so that there is always a possibility of some confusion in my observations.

I found the Black-capped Blackbird common in the High Range and above 3,500 ft. in the south. I also met it at Thattākād (200 ft.) at the foot of the former, where however it was rare. It was most abundant at Peermade (3,200 ft.) and Pādagiri (3,000 ft.—Nelliampathies) while at Mūnnār (5,000 ft.) in the Kanan Dēvan Hills it was also common. It kept to evergreen sholas principally about their periphery and was frequently to be seen feeding on the edge of paths and forest traces early in the mornings and at dusk singly, or in pairs or small parties.

Its food consisted to a very large extent of the berries of *Maesa perottetiana* DC., *Trema orientalis* Blume and *Lantana camara* while the birds also invariably resorted to feed on the nectar of the blossoms of *Erythrina lithosperma* shade trees in tea and coffee plantations wherever suitably situated.

Between November and February the Blackbird was silent except for a subdued but sharp high-pitched *krec-ee* uttered from time to time, varied occasionally by a throaty, quick-repeated *chuck-chuck-chuck*. Their silence at this season probably made them appear less common in many localities than they actually were.

On 1 February I have the first record of one trying to sing. It was a half-hearted effort of short duration and punctuated every now and again with the throaty *chucks*. By the last date of which I have a record (25 April—Mūthūkūzhi 4,000 ft.; Ashāmbū Hills), males were in full song about that elevation.

Breeding: It is doubtful if the Black-capped Blackbird breeds in Travancore or Cochin. The gonads of the specimens furnished no indication in this regard. It was noted, however, that the February specimens had either completed moult into fresh nuptial plumage or were in varying stages of doing so.

Turdus simillimus bourdilloni (Seebohm). Bourdillon's Blackbird.

Not met with by the Surveys, but Ferguson records it as common in the High Range and above 3,500 ft. in the southern Travancore hills.

Mr. Whistler has examined tht following specimens: *Brit. Museum*: ♂ 4-97, ♂ 4-98 Chimunji (Ferguson); ♂ 29-3-77 Mynall (Bourdillon); [♂] albinistic no ten'; ♂ 27-12-93 Chimunji; (♂ 17-4-80 Colathoorpolay, Patnas (F. Bourdillon); ♀ 97, ♀ 4-97 High Range (Ingleby); ♀ 5-91 High Range (Turner); [♀] 29-12-93, [♀] 4-98 Chimunji (Ferguson); ♀ 28-7-72 Pannuyar (?); ♂ 3-6-83 Kodaikanal (Terry); ♀ 18-5-83, juv. 17-5-83 Kukal, Pālni Hills (Terry). *Trivandrum Museum*: ♂ 18-1-01 Moonar, ♂ 5-3-03 Chimanji; ♀ 3-97 High Range (Ingleby); o? 22-1-01 Devicolum.

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He measures Travancore specimens only, as follows:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂	26-27	122.5-123.5	97-100.5	31.5-34 mm.
3 ♀♀	26-28	119.5-122	93.5-97.5	31-32.5 mm.

Breeding: Bourdillon and Ferguson (*J.B.N.H.S.*, xv, 466) took a nest at Chimunji in April (1903). *Nidification* (ii, 113) records another nest containing c/2 fresh eggs by the former on 14 May in dense evergreen forest at 3,500 ft. Mr. Stuart Baker (*loc. cit.*) also mentions that Kinloch took several nests in April in the Nelliampathy Hills 'undoubtedly' of this race and the 'builders are now in the Bombay Museum'. Inquiries at the Bombay Natural History Society reveal that there are now no skins collected by Kinloch in the Nelliampathies in their collection, and it is evident that the record requires fresh substantiation.

In the Pālni Hills, Terry took a nest with 1 egg on 18 May (1883) and another with c/3 on 3 June. He shot the owners which are now in the British Museum. A third bird shot by him from a nest with 3 eggs is in Dr. C. B. Ticehurst's collection.

Turdus simillimus simillimus (Jerdon). The Nilgiri Blackbird.

Not met with by the Surveys neither recorded by Ferguson or Bourdillon in Travancore nor by Kinloch in the Nelliampathies. In the Pālni Hills, however, both Fairbank and Terry record it as common at Kodaikanal and everywhere in the sholas above 4,000 ft. According to Terry (*S.F.*, x, 474) they breed there from the middle of March to the middle of June at least. Fairbank obtained two specimens (*S.F.*, v, 403) which are now in the British Museum. As noted above these two specimens are somewhat intermediate in character.

Geokichla wardii (Blyth). The Pied Ground Thrush.

Not met with by the Surveys.

The Pied Ground Thrush occurs in the Travancore-Cochin area apparently only as a rare passage migrant between its breeding haunts (*viz.* moderate elevations in the Himalayas from Kulu to Simla eastwards and in North Assam) and its winter quarters in Ceylon. The meagre records from the intervening peninsular area suggest that the bird travels by the Eastern Ghats route and does not linger much on the way.

Kinloch (*J.B.N.H.S.*, xxvii, 944) observed a single male in the Nelliampathy Hills in March which he considered to be on passage.

In Travancore, Ferguson (*J.B.N.H.S.*, xv, 466) obtained one in February on the High Range.

In the Palni Hills, Terry (*S.F.*, x, 474) procured a female on 1 March and a male on 3 March in thick sholas about a mile apart at Pulungi.

Its numbers in Ceylon are said to vary considerably in different years.

Geokichla citrina cyanotus (Jardine & Selby). The White-throated Ground-Thrush.

Specimens collected: 161 ♀ imm. 26-1-33 Sānthanpāra 3,500 ft.; 251 ♀ 9-2-33 Thattākād 200 ft.; 344 ♂ 23-2-33 Peermade 3,200 ft.; 496 ♂ 26-3-33 Tenmalāi 500 ft.; 905 ♀ 26-11-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Rājampāra (1,350 ft.—Panthalam Hills).

Colours of bare parts: Iris brown; bill blackish-brown, paler at chin; mouth yellowish-pink, pale pink, or greyish-pink with brown blotches on palate; legs and feet brownish flesh colour; claws duskier.

[Other material examined:

Brit. Mus. Coll.: ♂ 6-9-78, ♀ 30-11-84 Mynall (Bourdillon).

Sparrow Coll.: ♀ 28-3-14 Cardamom Hills.

Measurements:

	Bill.	Wing.	Tail.
3 ♂♂	23.5-24	111.5-113.5	73.5-80 mm.
5 ♀♀	22.5-24.5	105-110.5	73-75 mm.—H. W.]

The White-throated Ground Thrush was met with at elevations up to 3,500 ft. in Travancore and Cochin, being fairly common in shady cardamom

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sholas and well-wooded country, both deciduous and evergreen. It is usually met singly or in pairs and is particularly fond of overgrown ravines and nullahs. It feeds on the ground among the mulch and brushwood, but promptly flies up into the overhanging branches of trees on taking alarm. The only note heard between 24 November and 26 March (being dates on which it was first and last seen) was a subdued but high-pitched *kree-ee*.

I cannot throw any light on its status in this area. Both Bourdillon (*S.F.*, iv, 398) and Ferguson (*J.B.N.H.S.*, xv, 467) considered it a winter visitor, but *Nidification* (ii, 132) records the former taking nests in Travancore with eggs or young in May and June! Kinloch lists it as 'very common' in the Nelliampathies, but is silent as regards its status. Pillai evidently failed to meet it at Kūttyāni and other wooded groves in the environs of Trivandrum town between 15 July and 15 August.

The gonads of all the Survey specimens were in a quiescent state. No. 161 (26 January) was not fully adult as evidenced by the imperfect ossification of its skull.

This race has not been recorded from Ceylon though the northern (typical) race has occurred there 2 or 3 times.

Oreocincla dauma neilgherriensis Blyth. The Nilgiri Thrush.

Not met with by the Surveys. I have seen a specimen in the Trivandrum Museum said to come from Travancore, but lacking precise data.

According to Ferguson (*J.B.N.H.S.*, xv, 467) the Nilgiri Thrush is rare in Travancore, being found in the High Range above 4,000 ft. and also sparingly in the south. W. F. Bourdillon found it sparingly in thick jungle from the summit of the hills (in Central Travancore) down to about 2,000 ft. elevation.

Kinloch (*J.B.N.H.S.*, xxix. 564-5) records it as numerous on the Lily Downs (4,700 ft.) in the Cochin Nelliāmpathies.

In the Pālni Hills, according to Terry (*S.F.*, x, 474) it breeds, but apparently there are no records of its doing so in Travancore or Cochin.

Monticola cinclorhyncha (Vigors). The Blue-headed Rock-Thrush.

Specimens collected: 45 ♀ 9-1-33, 55 ♂ 10-1-33 Marāiyūr 3,500 ft.; 366 ♂ 27-2-33 Kūmili 3,000 ft.; 454 ♂, 455 ♀ 17-3-33, 481 ♂, 482 ♀ 21-3-33 Rājampāra 1,350 ft.; 881 ♂ 18-11-33 Kūriārkūtti 1,600 ft.; 998 ♀ 20-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Nemmāra (300 ft.).

Colours of bare parts: Iris dark brown; bill dark horny-brown, yellow at gape and on commissure and chin; gape and mouth yellow; legs, feet and claws greyish- or horny-brown; soles pale yellow.

[The Survey specimens measure:

	Bill.	Wing.	Tail.
4 ♂♂	23.5-24	101.5-105	69.5-71.5 mm.
3 ♀♀	23.5	98.5-101	66-67.5 mm.

There are 8 specimens in the British Museum from Mynall (Bourdillon) dated November (earliest date 13th), December, January and 9 March.

Nos. 45 and 55 are first winter birds. I do not understand the statement in the *Fauna* (ii, 182) that the young male is like the female. In neither juvenile plumage nor in first winter plumage does it resemble the adult female. In the juvenile male the upper plumage, including the lesser and median wing-coverts, is fulvous-yellow, each feather edged with brownish-black, giving a squamated appearance. The lower rump and upper tail coverts are pale chestnut, the feathers of the former lightly fringed with black. Lower parts similar to upper parts but paler, the squamation less marked on the throat, vent and undertail coverts. The wings and tail resemble those of the adult male but the primary and greater coverts have fulvous edges, the fulvous edges to the tertiaries are wider than in the adult, and the blue of the wing generally is much duller. The tail is lightly tipped with bright fulvous. The juvenile female has the same squamated plumage but lacks the chestnut rump-patch and the wings and tail are similar to those of the adult female, the greater coverts and tertiaries being edged with pale fulvous.

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This plumage is changed at the post-juvenal moult which takes place between July and September. The primaries and primary coverts, the secondaries and greater coverts, the tertiaries and tail are not then moulted and the first winter and first summer plumage differs only from the respective adult plumage in both sexes by the retention of those feathers until the second autumn moult which is complete. Adults have a complete moult about August and September. There is no spring moult, but the wearing off of the fringes to the feathers makes the summer plumage a little darker.—H. W.]

This Thrush is also a fairly common winter visitor in the Travancore-Cochin area, from the level of the low country to at least 3,500 ft., and doubtless higher. I do not seem to have come across it at Mūnnār or elsewhere about that elevation, but Ferguson found it at 5,000 ft. in the High Range. It is partial to broken country or stony hillsides covered with light deciduous and bamboo jungle, rather than to the more heavily wooded parts beloved of the White-throated Ground-Thrush. Its favourite facies may in fact be described in general terms as intermediate between the heavily wooded patches frequented by *Geokichla citrina* and the open sparsely covered rocky hillsides etc. preferred by *Monticola solitaria*.

Cardamom sholas and coffee plantations also provide admirable hunting grounds for this species. It was frequently met with singly in thin jungle about villages and cultivation, and it has the same habit of flying silently up into the overhanging branches of trees when disturbed. Sometimes the bird will descend to the ground to pick up an insect and fly up with it to its perch, very much in the manner of a Bush-chat.

Kinloch describes it as common in the Nelliampathy Hills, presumably in winter.

It has not been recorded from Ceylon.

The gonads of the specimens were in an undeveloped condition. Specimens Nos. 454, 455 (17 March) and 481 (21 March) were extremely fat and were obviously ready to emigrate. The fat scraped off the last named weighed 86 grains! No. 482 (21 March) was an immature bird with skull as yet imperfectly ossified. It was noted that about this time there was an overwhelming preponderance of males (as judged from plumage), a fact suggesting that the females had preceded the males on the outward migration.

A remarkable instance of a female (dissection and sexing confirmed!) assuming adult male plumage was noted in the case of specimen No. 455. The bird appeared in perfectly healthy condition and, as mentioned, was very fat.

Monticola solitaria pandoo (Sykes). The Indian Blue Rock-Thrush.

Specimens collected: 93 ♀ 14-1-33 Marāiyūr 3,500 ft.; 118 ♂ 20-1-33 Mūnnār 5,000 ft.; 346 ♂ 24-2-33 Peermade 3,500 ft.; 949 ♂ 6-12-33 Nemmāra 300 ft.

Elsewhere noted at: Sānthanpāra (3,500 ft.), Arāmboli (250 ft.).

Colours of bare parts: Iris brown; bill, legs, feet and claws blackish-brown; mouth lemon yellow or yellowish-pink.

[Measurements:

	Bill.	Wing.	Tail.
3 ♂♂	24.5-27	118-125	77.5-83 mm.
1 ♀	28.5	113.5	78.5 mm.

No. 93 is a first winter bird. This species has the same plumage sequence as in *Monticola cinclorhyncha*. The juvenile male is sooty-brown washed with bluish-grey, the feathers of the crown, sides of the face, chin, throat and upper breast with subterminal pale fulvous spots, the rest of the feathers faintly fringed with fulvous; wings and tail as in the adult male, but greater coverts and tail with broader pale edges. The juvenile female is similar but paler and browner, the wings and tail as in the adult female. The post-juvenal moult takes place about August-September and does not include the primaries and primary coverts, the secondaries and all but the inner greater coverts or the tail. These are not moulted till the second autumn. The adults undergo a complete moult about August to October. There is no spring moult.

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Both male and female show a certain amount of variation in the amount of spotting and barring of the body plumage.—H. W.]

The Blue Rock-Thrush is also a fairly common winter visitor to Travancore-Cochin. First seen 6 December; last 21 April. It is almost invariably seen as a solitary bird frequenting both low hummocky country and up to at least 5,000 ft. in the hills. It is essential, however, that the locality be open with plenty of sheet rock or scarps amidst sparse scrub with scraggy tufts of grass growing out of the crevices, such as is typical of the drier hillsides in this area. Stone quarries never fail to attract it. Kinloch also found it common in such facies in the Nelliampathy Hills. The only record of its occurrence in the Pālnis is apparently that of Capt. Bates from Kodaikanal on 6 April (1929, *J.B.N.H.S.*, xxxvi, 80).

It is a straggler to Ceylon (November-March).

Its food consists principally of insects, but I have frequently observed it feeding largely on the berries of *Lantana camara*.

The organs of the specimens showed no departure from the normal non-breeding condition.

Myophonus horsfieldii Vigors. The Malabar Whistling Thrush.

Specimens collected: 35 ♂ 7-1-33 Marāiyūr 3,500 ft.; 654 ♀ 24-4-33 Balamore Estate 2,000 ft.; 924 ♂ 30-11-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Mūnnār (5,000 ft.), Sānthanpāra (3,500 ft.), Thattākād (200 ft.), Mūndakāyam (ca. 1,000 ft.), Peermade (3,200 ft.), Kūmili (3,000 ft.), Rājampāra (1,350 ft.), Tenmalāi (500 ft.), Kūvallē (along Cochin Forest Tramway), Kūriārkūtti (1,600 ft.), Pādagiri (3,000 ft.).

Colours of bare parts: Iris hazel brown; bill, legs, feet and claws black; mouth pale yellow or creamy pink.

[Further specimens examined: *Brit. Mus. Coll.*: ♂ 3-7-78, ♀ 2-12-74 Mynall (Bourdillon).

Travancore-Cochin specimens measure:

	Bill.	Wing.	Tail.	Tarsus.
3 ♂♂	32.5-34.5	155.5-158.5	112-113.5	44-49 mm.
2 ♀♀	29.5	143.5-148	103-108	42-45 mm.

It is difficult to settle whether to consider this bird as a race of *M. cæruleus* or as a separate species. It is evidently from the same stock and reflects many features of the parent form. At the same time it has evidently been isolated for so long a period and has advanced so far on different lines that it has now really attained the rank of a separate species.—H. W.]

The Whistling Thrush is a common and familiar species throughout the forested portions of the Travancore-Cochin area in the foothills as well as higher up to at least 5,000 ft. elevation. It frequents the vicinity of streams and torrents, often about villages and human habitations. Its call is one of the earliest bird voices to be heard in the morning, being followed soon after by the Pitta. In December and January the rich rambling whistling song was seldom heard, but by the end of March and in April it had increased in frequency.

The bird moves about on the ground and on rocks in or by the streams in short hops, constantly jerking its tail and spreading it fanwise.

In the Pālni Hills, Fairbank and Terry both found it in sholas and wherever there was running water, from the base up to 5,000 ft.

It does not occur in Ceylon where it is apparently represented by the endemic *Arrenga blighi*.

Breeding: The gonads of the specimens were in an undeveloped condition. According to T. F. Bourdillon, the season in Travancore is April and May, the normal clutch comprising of 3 eggs. *Nidification* (ii, 154-5) gives June to August as the usual breeding season in Travancore, but mentions Stewart taking a nest as early as 13 February. It suggests that probably the birds breed twice.

At Panchgani (4,400 ft.—Western Ghats) I found breeding to be in full

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swing in July and August (1931). Two successive broods were common and the period of incubation was determined to be 16-17 days.

Family: Muscicapidae.

Siphia parva albicilla (Pallas). The Eastern Red-breasted Flycatcher.

Specimen collected: 388 [♂] 1-3-33 Kūmili 3,000 ft.

Elsewhere not noted.

Colours of bare parts: Iris dark brown; bill blackish-brown except chin and gape which whitish; mouth yellow; legs, feet and claws blackish-brown.

[The specimen is an adult male in full red-breasted plumage. This is a considerable extension of range for this species. The typical race has not been recorded below S. Mysore at the foot of the Nilgiris on the Bangalore road (Hume, *S.F.*, x, 372) and *S. p. albicilla* has not been recorded south of Belgaum (♀ 22-10-1879 Butler) and the Nallamalais (♂ imm. 7-11-29 Eastern Ghats Survey, *J.B.N.H.S.*, xxxvi, 81).

This specimen is undergoing the spring moult which appears to be chiefly confined to the red patch and its grey edging. First year males and females are alike and can only be distinguished from the adult female by the fact that the post-juvenal moult does not include the tertiaries, greater and primary coverts and wing quills which remain from the juvenile dress. The first year male evidently attains the red throat and grey edging in the first spring moult. —H. W.]

The specimen—the only one of the species met with in Travancore or Cochin —was shot off a large mango tree adjacent to the camp shed. Here it was sitting about in pretty twisting sallies after insects in among the branches or thence on to fence-posts or the ground to pick up an insect and back again uttering its characteristic *click, click* from time to time as it jerked its cocked-up tail.

The gonads were not distinct enough for the specimen to be sexed with certainty.

The Survey was unable to confirm the statement in the *Fauna* (ii, 211) that the typical race of this Flycatcher occurs in winter as far south as Travancore. Ferguson's list does not record it thence while neither Fairbank nor Terry appear to have met it in the Pālni Hills.

Muscicapula pallipes pallipes Jerdon. The White-bellied Blue Flycatcher.

Specimens collected: 129 ♂ 23-1-33 Sānthanpāra 3,500 ft.; 350 [♂] 24-2-33 Peermade 3,200 ft.; 373 ♀ 28-2-33, 393 ♀ 3-3-33, 404 ♀, 405 ♂ 5-3-33 Kūmili 3,000 ft.; 493 ♂ 26-3-33 Tenmalāi 500 ft.; 867 ♂ 15-11-33, 870 ♀ 16-11-33 Kūriārkūtti 1,600 ft.

Elsewhere noted at: Mūndakāyam (ca. 1,000 ft.), Pādagiri (3,000 ft.—Nelliāmpathy Hills.)

Colours of bare parts: Iris brown; bill brownish-black; mouth slaty-pink or greyish-pink; legs and feet horny-brown.

[The Survey specimens measure:

	Bill.	Wing.	Tail.	Tarsus.
5 ♂♂	17.5	73-79	57.5-63	18.5-19 mm.
4 ♀♀	15.5-17	72.5-75.5	55-61.5	18.5 mm.

Other specimens examined:

Brit. Mus. Coll.: ♂ 24-2-78 Travancore; o? n.d. Mynall (Bourdillon); o? juv. 9-90 Chimunji (Ferguson)—labelled *muttui*.—H. W.]

The White-bellied Blue Flycatcher though not numerically abundant, is common as a species in evergreen forest tracts throughout the two States. The lowest elevation at which I came across it was about 500 ft., the highest 3,500 ft., but as in the Nilgiris, it is probably also found higher up in the hills. It is a quiet unobtrusive little bird, keeping mostly to the dense under-growth of tall lanky seedlings or *Strobilanthes*, and is frequently a member of the localised bird associations common to this facies. It is also partial to cardamom sholas where it frequents the vicinity of the overgrown nullahs or ravines that run through them. Usually seen singly, most birds appeared to

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have paired off from about the beginning of March. It has a habit of screwing its tail from side to side like the Thick-billed Flowerpecker.

The species does not seem to have been recorded from the Pālnis.

It does not occur in Ceylon.

Breeding: In No. 373 (28 February) the ovary was distinctly granular and the follicles were further enlarged in 393 (3 March) and in 404 (5 March). The testes of 405 (pair to the last, and same date) measured 5×3 mm., those of 493 (26 March) 7×5 mm. All the birds were in immaculate plumage and appeared to be breeding or about to. The rest of the specimens showed no genital development.

Stuart Baker records (*Nidification*, ii, 195) that J. Stewart took nests in Travancore between 1 and 2,000 ft. elevation chiefly during the rains, but that he also found some as early as February and others as late as September. The normal clutch is said to be almost invariably of 4 eggs.

The evidence obtained by the Surveys tends to confirm the usual breeding season given in the *Fauna* (ii, 228) as March and April.

Muscicapula rubeculoides rubeculoides (Vigors). The Blue-throated Flycatcher.

Specimens collected: 238 [♀] 7-2-33 Thattākād 200 ft.; 463 ♂ 18-3-33 Rājampāra 1,350 ft.

Elsewhere not noted.

Colours of bare parts: Iris brown; bill brownish-black; mouth greyish-pink or slaty-pink; legs, feet and claws greyish-brown (with a pinkish tinge in No. 238).

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
♂	broken	75	56.5	— mm.
♀	16	72.5	missing	15.5 mm.

This is a new record for Travancore, though the bird has several times been recorded from the Madras Presidency.—H. W.].

This Flycatcher—apparently a winter visitor only—was usually seen singly in scrub and secondary jungle with tangles of creepers, on the fringe of evergreen forest.

No. 463 (18 March) was excessively fat and evidently preparing to emigrate. A very marked preponderance of males over females was noted at Rājampāra about the time the specimen was secured. The trill of the male which was being frequently uttered, is similar to yet clearly distinguishable from that of Tickell's Blue Flycatcher also present in the same locality, and in common with the latter it has the characteristic flycatcher habit of flicking its cocked-up tail and uttering *chr-r*, *chr-r* or *click*, *click*.

In Ceylon it is apparently not an uncommon winter visitor from October to April.

Muscicapula tickelliae tickelliae (Blyth). Tickell's Blue Flycatcher.

Specimens collected: 44 ♂ 9-1-33 Marāiyūr 3,500 ft.; 452 ♂ 17-3-33, 470 ♂ 19-3-33, 484 ♀ 21-3-33 Rājampāra 1,350 ft.; 884 ♂ 18-11-33 Kūriārkūtti 1,600 ft.

Elsewhere noted at: Mūnnār (5,000 ft.), Thattākād (200 ft.), Wadakkāncheri (400 ft.).

Colours of bare parts: Iris dark brown; bill brownish-black; mouth slaty-pink; legs and feet greyish-brown; claws brown.

[Other specimens examined:

B. M. Coll.: o? 28-5-77 Pālni Hills (Fairbank).

Sparrow Coll.: ♂ 1-4-14 Kūmili, Travancore.

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
5 ♂♂	14.5-16	70-76.5	55-68	16.5-17 mm.
1 ♀	15	69	55	16 mm.—H. W.]

Tickell's Blue Flycatcher, though curiously enough not appearing in Ferguson's Travancore list, is a fairly common species in our area. It avoids ever-

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green forest and prefers opener scrub and secondary jungle of more or less deciduous aspect, especially where intermixed with bamboo or Eeta (*Ochlandra*). I came across it between 200 and 5,000 ft. elevation. Its freely repeated musical little trill invariably gave away its presence long before the bird was seen. This song is apparently uttered all the year round, though more frequently during the breeding season.

Fairbank (*S.F.*, v, 402) obtained a specimen in the Pālni Hills (evidently the one now in the British Museum) and observed it 'unfrequently from top to bottom', while Terry (*S.F.*, x, 473) found it breeding in the Pittur Valley. Kinloch also obtained nests in the Pālnis (*Nidification*, ii, 202).

In Ceylon it is represented by the race *meşœa* which is endemic to the island.

Breeding: The November and January specimens showed no genital development. Nos. 452 (17 March) and 470 (19 March) on the other hand both had testes enlarged to 6×4 and 5×4 mm. respectively, while the female (No. 484—21 March) had a distinctly granular ovary and a prominent incubation patch. All the 3 latter were in freshly moulted plumage.

On 21 March also, a male was observed conveying building material—a bunch of fibres—in its bill, and nesting was obviously in progress.

Eumiyas thalassina thalassina (Swainson). The Verditer Flycatcher.

Specimen collected: 191 ♂ 30-1-33 Sānthanpāra 3,500 ft.

Elsewhere noted at: Thattākād (200 ft.), Peermade (3,200 ft.).

Colours of bare parts: Iris brown; bill horny-black; mouth pale yellowish-flesh colour; legs, feet and claws blackish-brown.

[The Survey male measures:

Bill.	Wing.	Tail.	Tarsus.
14	86	70	17 mm.

Other specimens examined:

B. M. Coll.: ♀ 20-11-74, ♂ 2-12-78, ♂ 27-11-74 Mynall (Bourdillon).—H. W.]

This Flycatcher (a winter visitor) is certainly much less common than the following species which it closely resembles in habits. Ferguson did not come across it in Travancore, but Bourdillon who procured the above specimens notes it as a common though not abundant winter visitor 'up to 2,000 ft.' from December to March. I did not meet with it in Cochin although Kinloch (*J.B.N.H.S.*, xxvii, 939-44) describes it as 'very common' in the Nelliampathies in the cold weather till the end of March at comparatively low elevations. He obtained a specimen at 3,300 ft.

Neither Fairbank nor Terry have recorded it from the Pālni Hills though it must doubtless occur there in the cold weather.

It is not recorded from Ceylon.

The distribution of this Flycatcher in *Nidification* (ii, 206) is rather misleadingly worded. So far we have no evidence that the bird breeds anywhere in India proper south of the Himalayas.

Eumiyas albicaudata (Jerdon). The Nilgiri Verditer Flycatcher.

Specimens collected: 2 ♀ 4-1-33, 20 ♂ 6-1-33, 49 ♀ imm. 9-1-33 Marāiyūr 3,500-4,500 ft.; 102 ♂ 17-1-33 Mūnnār 5,000 ft.; 153 ♂ 25-1-33 Sānthanpāra 3,500 ft.; 428 ♂ 9-3-33 Camp Derāmalāi 3,000 ft.; 995 ♂ 19-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Mūthūkūzhi (4,000 ft.—Ashāmbū Hills).

Colours of bare parts: Iris dark brown; bill horny-black (somewhat browner in imm. No. 49); mouth greyish-pink or brownish-pink; legs, feet and claws blackish-brown.

[There is a series from the Pālnis and a ♂ February 1892 Devikulam (O. W. Turner) in the British Museum.

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Travancore and Pālni specimens measure:

	Bill.	Wing.	Tail.	Tarsus.
7 ♂♂	14-15.5	75.5-81	59-66	18.5-19.5 mm.
2 ♀♀	13-15	76-77	56.5-60.5	18.5 mm.—H. W.]

The Nilgiri Verditer Flycatcher is a common and abundant species throughout the forested hills of Travancore and Cochin. I came across it between 3,000 and 5,000 ft. and this is clearly the range of elevation it favours most. It is usually met singly frequenting overgrown hill streams and nullahs, undergrowth flanking paths and traces through sholas, cardamom plantations and the edge of forest clearings, often in association with *Culicicapa*, *Alseonax muttui*, and other flycatchers.

The males have a pleasant trilly song somewhat feebler than but similar in quality to that of *Saxicola caprata*. It lasts from 5 to 10 seconds and is constantly uttered from some exposed twig on the top of a tree. I have notes of birds singing in every month while the Surveys were in the field, from December to April. Ordinarily it perches somewhat upright on a twig and utters the typical flycatcher *click, click* as it twitches its tail up and down.

In the Pālni Hills, Fairbank (*S.F.*, v, 402) found this Flycatcher an abundant inhabitant of Kodaikanal and other groves from 5,500 ft. to the summit of the hills.

In Ceylon it is represented by an allied species *E. ceylonensis* (=*sordida*).

Breeding: The specimens furnished no evidence of breeding and apparently there are no actual records of nests and eggs taken in Travancore or Cochin. It is a permanent resident, however, and known to breed in the adjacent portions of its range between March and May, occasional nests being found in February or June. Mr. Stuart Baker has records of its occurrence and breeding in the Pālni Hills, the Wynaad, Palghat and Southern Malabar (*Nidification*, ii, 210).

Alseonax latirostris (Raffles). The Brown Flycatcher.

Specimens collected: 51 ♂ 10-1-33 Marāiyūr 3,500 ft.; 204 ♀ 3-2-33, 262 ♀ 10-2-33 Thattākād 200 ft.; 362 ♂ 27-2-33, 386 ♂ 1-3-33, 397 ♂ 3-3-33, 402 o? 5-3-33 Kūmili 3,000 ft.; 433 o? 10-3-33 Camp Derāmalāi 3,000 ft.; 444 ♂ 16-3-33, 478 ♀ 21-3-33 Rājampāra 1,350 ft.; 990 ♀ 18-12-33 Pādagiri 3,000 ft.; 1020 ♀ Karūpadanna ca. S.L.

Elsewhere noted at: Wūndamet (ca. 3,500 ft.), Trivandrum (ca. S.L.), Kūvallē (ca. 1,000 ft.) along Cochin Forest Tramway, Nemmāra (300 ft.), Wadakkāncheri (300 ft.).

Colours of bare parts: Iris dark brown; upper mandible and tip of lower mandible horny-brown; rest of lower mandible cream colour (in No. 402 lower mandible—except tip—chrome yellow!); mouth pale yellow or pale yellowish-pink; legs, feet and claws horny-brown.

[Other specimens examined:

B. M. Coll.: ♂ 30-12-80 Kallaur road 1,000 ft. (Bourdillon); ooo no dates Mynall; ♀ 7-3-77, ♂ 18-10-78 Mynall; o? -3-75 Eridge.

Travancore specimens measure:

	Bill.	Wing.	Tail.	Tarsus.
7 ♂♂	12.5-15	69.5-76	48-54	12.5-14.5 mm.
6 ♀♀	12.5-15.5	69-73	46-51.5	—

This bird is now on the British list and therefore finds inclusion in Witherby's *Practical Handbook of British Birds*, vol. i, p. 287. The juvenile is there described from specimens of which the correct identification appears uncertain, and as the description does not agree with a specimen collected by me personally from a family party of which the adult male was also collected (23 June 1921 near Larji 3,000 ft., Valley of the Beas, Kulu) a full description may be given: Crown, nape, hindneck, mantle, scapulars, lesser wing-coverts, back and rump pale fulvous buff, each feather with a dark brown fringe and a grey base, the general appearance being squamated; median wing-coverts dark brown, with a large triangular buff spot at tip of each

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feather; greater wing-coverts dark brown, edged exteriorly and broadly tipped with warm fulvous; primary coverts dark brown, the tips lightly edged with buff; primaries, secondaries and tertiaries as in the adult, except that the tertiaries have the pale buff border rather broader at the tips; upper tail coverts dark brown broadly tipped with fulvous; tail as in the adult, the feathers with a small buff spot at their tips; sides of the head and neck mottled brown and buff; lower plumage white, faintly washed with buff on the chin, throat and breast, all feathers except on centre of abdomen lightly fringed or tipped with dark brown, giving a faintly squamated appearance.

This plumage is moulted at the post-juvenal moult with the exception of the greater and primary coverts, primaries, secondaries and tertiaries and probably tail, but wear and fading soon render it impossible to separate first winter birds and adults with certainty. The post-nuptial moult is complete and takes place about August to October. There is, I think, no spring moult in the adult. It will be noted that my view of the moults of this species differs considerably from that given in the *Practical Handbook*.—H. W.]

The Brown Flycatcher was met by the Surveys between 11 November and 30 March, after which date it was not seen at all. The fact that specimens collected on 10 and 16 March were excessively fat, suggests that at about this time most birds were preparing to emigrate although the last specimen, obtained on 21 March, was in normal condition. There is great uncertainty as regards the status of this Flycatcher in the Travancore-Cochin area as indeed there is in the other parts of its Indian and south-eastern range. Ferguson considered it a common winter visitor to Travancore but thought that some individuals breed there as he had specimens collected in June and August (*J.B.N.H.S.*, xv, 464). Personally I am not in a position to say anything definite on the subject as I was not in the area during May and June which is said (*Fauna*, ii, 250) to be the breeding season everywhere. Pillai who collected during July and August in the environs of Trivandrum—whence I have sight records for March—does not appear to have come across the species then. It is possible that odd pairs occasionally remain to breed as in North Kanara which is the nearest *known* breeding place (Davidson, *J.B.N.H.S.*, xi, 668). Indeed that they may well do so is more than suggested by the testes of No. 362 (27 February) which had enlarged to 6×3 mm.

The Surveys found the Brown Flycatcher fairly common in Travancore-Cochin from about sea-level up to at least 3,500 ft. in the hills. It affects sparse deciduous jungle (commonest at Kūmili!) and avoids evergreen forest, though it may frequently be seen on the verge of this where it opens out into grassland. The bird is partial to the neighbourhood of rocky hillstreams and was also commonly met with in and about rubber plantations, among the shade trees of comparatively open cardamom sholas and in the mango, jack and cashew gardens by homesteads along the backwaters. It is usually seen singly, sometimes in pairs.

The only notes I heard it utter were a feeble *chi-chir-ri-ri-ri* something like *Dumetia*, but feebler.

This Flycatcher is apparently rare in the Pālni Hills as both Fairbanks and Terry met it only once. No dates are given and no comment on its status is made.

It is a winter visitor to Ceylon from October to April (Legge), but according to Wait it has also been obtained in the Island in June.

The gonads of the specimens were in a quiescent state except in the case of the ♂ mentioned.

Messrs. Whistler and Kinnear (*J.B.N.H.S.*, xxxvi, 86) after examining a considerable number of specimens of this species from the different parts of its wide range are not satisfied that it has any races. In a recent work on the birds of North-Eastern Asia,[1] Sten Bergman gives the wing measurements of 3 ♂♂ obtained in the Kuril Islands listed by him under the typical race. The figures—70-72 mm.—correspond closely enough with those given by Whistler and Kinnear for 4 ♂♂ from Amur Bay, Eastern Siberia (68.5-71 mm.) to support their contention of the non-existence of races.

[1] Zur Kenntnis nordöstasiatischer Vögel, Sten Bergman, Stockholm (1935).

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Alseonax ruficauda (Swainson). The Rufous-tailed Flycatcher.

Specimen collected: 377 ♀ 28-2-33 Kūmili 3,000 ft.

Elsewhere noted at: Kūvallē Incline (ca. 1,000 ft.—Cochin Forest Tramway); Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris dark brown; upper mandible brown, lower mandible pale flesh-colour; mouth yellow and pink; legs and feet brownish-plumbeous; claws horny-brown.

[Other specimens examined:

B. M. Coll.: ♂? 27-11-74, ♂? 4-12-78, ♂? no date Mynall (Bourdillon); ♀ -12-90 Ponmūdi (Ferguson).

The Survey ♀ measures:

Bill.	Wing.	Tail.
14.5	75.5	56 mm.—H. W.]

Apparently this Flycatcher is an uncommon winter visitor to the area. All the specimens I came across were on the outskirts of evergreen forest, by traces and clearings, between 2,000 and 3,500 ft. elevation.

It has not been recorded from the Pālni Hills or Ceylon, though it doubtless occurs in the former.

Alseonax muttui muttui (Layard). Layard's Flycatcher.

Specimens collected: 128 ♂? 23-1-33, 151 ♀, 152 ♀ 25-1-33 Sānthanpāra 3,500 ft.; 212 ♀ 4-2-33, 231 ♂ 7-2-33 Thattākād 200 ft.; 292 ♂ 16-2-33 Urumbikera Res. Forest ca. 1,000 ft.; 877 ♂ 17-11-33 Kūriārkūtti 1,600 ft.; 999 ♂ 20-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Marāiyūr (3,500 ft.); Peermade (3,200 ft.); Rājampāra (1,350 ft.—Pandalam Hills).

Colours of bare parts: Iris dark brown; upper mandible dark horny-brown, lower mandible pale flesh colour; mouth yellow (in two examples with a pinkish tinge); gape in the same two yellow; claws dusky.

[Other specimens examined:

B. M. Coll.: ♂ 18-11-74, ♀? 14-1-76, ♂? no date Mynall (Bourdillon); ♀ 29-12-85 Chimpani, Travancore-Tinnevelly boundary (William Davison).

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂	16-17.5	72-74.5	49-53.5	13.5-14 mm.
3 ♀♀	16-17	70.5-72.5	51-54.5	13.5-14 mm.—H. W.]

Layard's Flycatcher is a common winter visitor to Travancore and Cochin. The last date I noted it on was 17 March. By the time the next suitable locality was visited—22 April—the species had completely disappeared. Not a single specimen was observed in the subsequent five days inspite of the special look-out which was kept.

Although examples were obtained as low down as 200 ft. elevation, the bird was commonest on the hills between 1,000 and 3,500 ft. It was inseparable from evergreen forest tracts, frequenting the dense scrub and liana tangles, preferably on the fringe of jungle, and cardamom clearings where the bare branches of the felled trees, their stumps and other brushwood littering the hillsides provided admirable bases for its sallies after winged insects. The vicinity of rocky wooded streams also constituted a favourite haunt. The bird was invariably met singly, but frequently in loose association with *Eumiyas*, *Culicicapa*, *Tchitrea* and other flycatchers.

It has evidently not been recorded from the Pālni Hills and its status in Ceylon is the same as in Travancore, i.e. winter visitor.

William Davison (*Ibis*, 1888, pp. 146-7) obtained 4 males 'late in December or early in January' on Chimpani Hills dividing Travancore territory from the Tinnevelly District.

The gonads of all the specimens were undeveloped and so far we have no evidence in support of the suggestion in the *Fauna* (ii, 252) that it will most

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probably be found to be a resident and to breed over much of its 'supposed' winter habitat on mountains of sufficient height.

Ochromela nigrorufa (Jerdon). The Black-and-Orange Flycatcher.

Specimens collected: 103 ♂ 17-1-33 Mūnnār 5,000 ft.; 330 ♀ 22-2-33 Peermade 3,200 ft.

Elsewhere noted at: Sānthanpāra (3,500 ft.); Camp Derāmalāi (at ca. 4,500 ft.).

Colours of bare parts: Iris brown; bill blackish-brown; mouth brownish-pink (No. 103 ♂), pale pink (No. 330 ♀); legs, feet and claws greyish-brown (No. 103), greyish-flesh (No. 330).

[Other specimens examined:

B. M. Coll.: ♂ 7-4-80 Travancore-Tinnevelly boundary 3,600 ft. (Bourdillon); ♂ no date Pālnis (Fairbank).

B. N. H. S. Coll.: ♂ 29-3-94 Kodaikanal (J. P. Cook).

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
2 ♂♂	13-13.5	61-63	49-51	18.5-20 mm.
1 ♀	13	58.5	44.5	18.5 mm.—H. W.]

The Black-and-Orange Flycatcher is essentially a bird of dense evergreen forest. According to Ferguson (*J.B.N.H.S.*, xv, 464) it is 'common on the High Range and at elevations of 3,500-4,000 ft. in the south'. I did not come across it either in the Ashāmbū Hills or in the Nelliampathies, neither has Kinloch recorded it from the latter. Where occurring, it was not uncommon between 3,000 and 5,000 ft., being perceptibly more abundant in the neighbourhood of the latter elevation. Below 3,000 ft. it was not observed.

The bird frequents the Eeta facies or flits about amongst the dense undergrowth of seedlings, *Strobilanthes*, *Pandanus* or *Calamus* singly or in pairs, the male uttering a somewhat metallic high-pitched *chīki-riki-chīki* or *chee-r-ri-ri* every few seconds. It is not shy and does not resent observation at close quarters provided one remains motionless. At Mūnnār I frequently saw it by the roadside near the workshop, the noise within and the motor traffic without not seeming to disturb it at all.

In the Pālni Hills it is said to be the commonest of the flycatchers at higher elevations. Fairbank (*S.F.*, v, 401) observed it in groves at the top of the hills and also at Shemiganūr (5,500 ft.) in dense thickets.

The species does not extend into Ceylon.

Breeding: The gonads of the survey specimens showed no departure from the normal non-breeding condition. The breeding season in Travancore is stated (*Nidification*, ii, 221) as March and April. Both Bourdillon and Stewart took nests at between 3,000 and 4,000 ft. elevation. They are said to be nearly always built of Eeta (*Ochlandra*) leaves and from a few inches to about 4 ft. from the ground, but usually between 2 and 3 ft. Two eggs is said invariably to be the full clutch.

Culicicapa ceylonensis ceylonensis (Swainson). The Grey-headed Flycatcher.

Specimens collected: 50 ♀ 10-1-33 Marāiyūr 3,500 ft.; 415 ♂ 7-3-33 Kūmili 3,000 ft.

Elsewhere noted at: Kūmarikkāi Malāi (7,000 ft.); Sānthanpāra (3,500 ft.); Camp Derāmalāi (3,000 ft.); Ashāmbū Hills (only at ca. 3,500 ft. and above!); Kūriārkūtti (1,600 ft.); Pādagiri (3,000 ft.—Nelliampathy Hills).

Absent at Thattākād (200 ft.)!

Colours of bare parts: Iris dark brown; upper mandible horny-brown, lower mandible pale yellowish-horn; mouth yellow; legs and feet brownish-orange; claws horny-brown; soles bright orange.

[Other specimens examined:

B. M. Coll.: ♂ ?-2-92 High Range (A. N. Nair).

Sparrow Coll.: ♀ 10-3-14 Cardamom Hills.

B. N. H. S. Coll.: ♂ 30-12-93 Chimunji (Ferguson).

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Measurements:

	Bill.	Wing.	Tail.	Tarsus.
3 ♂♂	13	64-66	53.5-57	— mm.
2 ♀♀	12.5-13	59-63	50-54	13 mm.—H. W.]

This little Flycatcher was commonly met with by the Surveys in hilly, forested country between 1,500 and 7,000 ft. It appeared to be inseparable from evergreen forest, but presumably inhabits the higher hills only as at Thattākād (200 ft.) it was absent and significantly enough I have no record either from Tenmalāi (500 ft.) or Rājampāra (1,350 ft.). Ferguson (*J.B.N.H.S.*, xv, 465) described it as 'common on the High Range and on the tops of the hills in the south'.

It frequents sholas on the hillsides and along ravines, and also opener secondary growth on their outskirts and bamboo forest, especially the vicinity of streams and torrents. Along the trace from Kūmili to Wūndamet (Cardamom Hills) over open grassy undulating hills (ca. 3,500-4,000 ft.), little sholas appear from time to time in dank ravines, often barely a couple of acres in extent, and separated from the next by a mile or more. Each of these wooded dells invariably harboured a couple or so of Grey-headed Flycatchers, and here as elsewhere they were mostly observed in association with *Phylloscopus occipitalis* and other small bird species, acting as outriders to the foraging assemblies and snapping up any winged insects escaping from their concerted hunt among the foliage.

In my experience the commensalism between this Flycatcher and *Phylloscopus occipitalis* is a fairly constant feature. I have observed them in company almost invariably, not only in Travancore and Cochin but also in the Nilgiri and Biligirirangan Hills of South India. It is noteworthy that the only occasion on which I came across this Flycatcher in the Hyderābād State it was also in association with a flock of *Phylloscopus occipitalis*.

A pretty little 'song' of 5 whistling notes—*chick! whichee whichee?* (accent on last 2, which end interrogatively)—is constantly uttered in between the short, graceful twisting sallies after flies, gnats etc. and is surprisingly loud for the size of the bird.

In the Pālni Hills, Fairbank (*S.F.*, v, 401) found it common in Kodaikanal as well as in groves 'lower down'—to what elevation is not mentioned.

In Ceylon it is a resident form above 1,000 ft.

Breeding: The testes of No. 415 (7 March) were in non-breeding condition, although the ovary of No. 50 was distinctly granular on 10 January.

The breeding of this species has apparently never been recorded in the Travancore-Cochin area. The season over the whole of its range is said to be April, May and June (*Fauna*, ii, 255).

Tchitrea paradisi leucogaster (Swainson).

Specimen collected: 34 ♂ 7-1-33 Marāiyūr 3,500 ft.

Tchitrea paradisi paradisi (L.). The Paradise Flycatcher.

Specimens collected: 202 ♂ 3-2-33 Thattākād 200 ft.; 395 ♂ 3-3-33 Kūmili 3,000 ft.; 600 o? 16-4-33 Arāmboli 250 ft.; 865 ♂ 14-11-33 Kūriārkūtti 1,600 ft.; 900 ♀ 25-11-33 Wadakkāncheri 400 ft.; 958 ♀ 8-12-33 Nemmāra 300 ft.

Elsewhere noted at (races uncertain): Kottāyam (ca. S.L.); Ūrūmbikera Res. Forest near Mūndakāyam (ca. 1,000 ft.); Rājampāra (1,350 ft.); Tenmalāi (500 ft.); Trivandrum (S.L.); Pādagiri (3,000 ft.—Nelliampathies); Trichūr, Karūpadanna (S.L.).

Colours of bare parts: Iris dark brown; bill greyish-blue, blackish at extreme tips; mouth greenish-yellow or bright yellow (202); gape and eyelids slaty-blue; legs and feet greyish-blue; claws brown.

[No. 34, although it is slightly darker than many specimens of *leucogaster* —but not all—and has the longer tertiaries black and white which is unusual, must I think be referred to this race as it has the primaries, secondaries, primary coverts and bastard wing black and white. This is a slight southerly extension of the known winter range of this form. The streamers vary *inter se*. One is chestnut; the other is chestnut but has the outer web almost entirely white and there is some white mottling on the inner web. It measures: Bill, 23; Wing, 98.5; True Tail, 108; Streamers, 256 mm.

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As I have already pointed out in the Eastern Ghats Report (*J.B.N.H.S.*, xxxvi, 89) there must be some satisfactory explanation of the curious status and migrations of the Paradise Flycatcher in Ceylon as described by Legge on theories that are hardly convincing; and the most obvious explanation would seem to be that there is a resident short-tailed race in the island in which the white phase is eliminated. This point can however be settled only by careful field work in the island and I have seen no evidence for the supposedly richer colouration of the females and young—as compared with the typical form—on which Mr. Stuart Baker (*Nidification*, ii, 236) now accepts a race *T. p. ceylonensis* for 'Ceylon and the extreme south of Travancore'. The Survey series shows no difference between birds from the extreme south and the rest of Travancore, nor can I separate them from the typical form.

Measurements:

	Bill.	Wing.	True Tail.	Streamers.	Tarsus.
No. 865 red ♂ with red streamers	25	96	107.5	254	17 mm.
Nos. 202, 395 ♂ like ♀	24-25.5	86-87.5	95-96.5	—	16 mm.
Nos. 900, 958 ♀♀	23.5	89.5-92.5	101-112	—	— mm.

—H. W.]

During the period the Surveys were in the field—November to April (both inclusive)—the Paradise Flycatcher was noted as a fairly common though perhaps not numerically abundant species throughout the area from the coast upto—with the exception of Marāiyūr (3,500 ft.) and Pādagiri (3,000 ft.)—about 1,500 ft. in the hills. It was, however, commonest in the low country under 1,000 ft. Mr. Pillai, who collected in the environs of Trivandrum town in July and August informs me that inspite of special effort he failed to meet any Paradise Flycatchers there during that period. Ferguson mentions (*J.B.N.H.S.*, xv, 465) that in the 'dry weather' [February-March?] it ascends the hills to considerable elevations. He procured specimens at 6,000 ft. on the High Range and also on the summit of the hills in the south (i.e. 3,500-4,000 ft.).

The bird was met with singly as a rule in mixed bamboo forest, on the fringe of evergreen jungle, in rubber plantations and groves of large trees as also in the jack-fruit and cashew gardens surrounding homesteads along the backwaters.

In evergreen patches it was commonly observed in association with *Dendrocitta leucogastra, Dissemurus paradiseus, Hypothymis azurea, Phylloscopus occipitalis, Culicicapa* and the other usual members of localised hunting parties.

On one occasion while walking through evergreen undergrowth in forest at Thattākād, I noticed a male in red plumage fluttering about helplessly among the leaves on the ground, unable to fly. Examination showed that the flight feathers of one wing had become pinioned by a bunch of hooked seeds of the grass *Streptogyne crinita* Beauv. When the tangle was removed, the bird flew off. This suggests that accidents of this kind must not infrequently befall birds descending to the ground to pick up insects etc. since in places the grass is not uncommon.

I do not think much significance need be attached to Kinloch's statement that in the Nelliampathies males in white plumage preponderate over females or red males. White males are certainly more conspicuous wherever they are, and it may even be that at the period Kinloch made his observation there may have been a migrational wave of white males. In many bird species the sexes migrate separately, and for all we know the Paradise Flycatcher may well be one of them. I myself have noted that at Nemmāra (8 December) red plumaged males and females were common, but white males exceedingly rare.

In the Pālnis, it appears to be uncommon. Fairbank (*S.F.*, v, 401) observed a single 'young one' [red?] at the base of the hills and Terry met another single bird at Pulungi.

The typical race occurs in Ceylon, but see Mr. Whistler's remarks *supra*.

Breeding: The gonads of all the survey specimens were undeveloped and gave no indication as regards breeding. *Nidification* (ii, 236) mentions Mr. J. Stewart taking a nest with 3 eggs in the extreme south of Travancore on

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14 March, and this probably constitutes the only record we have of the breeding of the Paradise Flycatcher in our area.

Hypothymis azurea styani (Hartlaub). The Indian Black-naped Flycatcher.

Specimens collected: 48 o? imm. 9-1-33 Marāiyūr 3,500 ft.; 136 ♂ ad. 23-1-33 Sānthanpāra 3,500 ft.; 394 ♂ ad. 3-3-33 Kūmili 3,000 ft.; 891 ♂ ad. 21-11-33 Kūriārkūtti 1,600 ft.

Elsewhere noted at: Thattākād (200 ft.); Ūrūmbikera Forest near Mūndakāyam (ca. 1,000 ft.); Rājampāra (1,350 ft.); Tenmalāi (500 ft.); Wadakkāncheri (400 ft.).

Colours of bare parts: *Adult male*: Iris dark brown; bill bright blue with blackish tips; mouth greenish- or sulphur-yellow; legs and feet slaty-blue; claws brown. *Immature* (No. 48): Iris dark brown; upper mandible horny-brown, lower mandible brownish-grey; mouth yellow; legs and feet blackish-slate; claws brown.

[Further specimen examined:
Brit. Mus. Coll.: ♂ 11-2-75, ♂ no date Mynall (Bourdillon).

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
5 ♂♂	14-15	66.5-74	65-74	16 mm.

These specimens, together with additional ones that I have examined from N.-E. India, confirm my action (*J.B.N.H.S.*, xxxvi, 91) in not accepting two races in India.—H. W.]

The Black-naped Flycatcher was met with in well-wooded country at all elevations between 200 and 3,500 ft., and was not uncommon in the localities recorded.

Dense bamboo forest, the lofty shade trees of cardamom plantations, evergreen sholas and opener teak plantations all appeared to attract it equally, and single birds or pairs were frequently to be found in the localised bird associations in all these facies. As a rule they kept to taller trees than other flycatchers did, flitting about amongst the sprigs and foliage or spreading and partly erecting the tail and pivoting on their perch from side to side to the constant accompaniment of a lively high-pitched *chee-chwee*.

So far it has evidently not been recorded from the Pālni Hills.

In Ceylon, the race *H. a. ceylonensis* is endemic to the Island.

Breeding: The specimens showed no gonadal development. No. 48 (9 January) was immature (in first winter plumage) with a soft skull, suggesting that it had been bred late in the year. No records of its breeding in the Travancore-Cochin area are available, but in the Nilgiris the usual breeding season is said to be June and William Davison found a nest with newly hatched young as late as 28 August.

Leucocirca aureola compressirostris Blyth. The Southern White-browed Fantail Flycatcher.

Specimens collected: 312-313 ♂♀ 19-2-33 Kottāyam ca. S.L.; 682 ♀ 17-7-33 (Pattom), 719 ♀ 24-7-33 (Thirūmalāi 100 ft.), 730 o? 26-7-33 (Kūttāni 300 ft.), 755 ♂ 31-7-33 (Akkūlam 150 ft.), 796 o? 6-8-33 (Pūlayanār Kotta 200 ft.), 857 ♀ 14-8-33 (Golf Links 100 ft.) Trivandrum Environs; 936 ♀ 4-12-33 Nemmāra 300 ft.; 1015 ♂ Karūpadanna ca. S.L.

Elsewhere noted at: Chālakūdi, Trichūr.

Colours of bare parts: Iris brown; bill brownish-black; mouth pink; legs, feet and claws blackish-brown.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
2 ♂♂	15	85-87	86.5-91.5	18 mm.
5 ♀♀	13.5-15	80-81	83-86	17-18.5 mm.

The alleged difference between the birds of North and South Travancore given in the *Fauna* (ii, 279) has already been shown (*J.B.N.H.S.*, xxxvi,

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92) to be incorrect, and that decision is again confirmed by the survey series. All the birds belong to the one race *compressirostris* and exhibit the characteristics defined in the Eastern Ghats Survey paper.—H .W.]

This Fantail Flycatcher is, as stated by Ferguson, common in the low country in both the States, and the Surveys did not meet it in the hills at all. This is rather curious since Dewar (*J.B.N.H.S.*, xvi, 154) considered it very numerous at Coonoor (5,500 ft.—Nilgiris) and Fairbank (*S.F.*, v, 401) found it up to 4,000 ft. in the Pālni Hills. However, as both these authors omit *pectoralis* from their lists doubt has been cast upon the correctness of their identifications. I personally found *pectoralis* sparingly at Kotāgiri (6,300 ft.—Nilgiris) while up there between July and December (1932), but have only one unconfirmed record of hearing *aureola* (at about 6,000 ft.) on 9 August.

Its favourite haunts in Travancore and Cochin are the mango, cashew and jack-fruit gardens surrounding the homesteads along the backwaters, and wooded compounds in towns. It also frequents groves of large trees such as mango and tamarind preferably in the neighbourhood of human habitations, and to a lesser extent light secondary and scrub jungle.

It is a resident species in Ceylon.

Breeding: Nos. 312 and 313, a pair (19 February) were breeding. The testes of the ♂ measured 8×5 mm., while many of the ovarian follicles of the ♀ were over 1 mm. in diameter. The pair were hopping about on the ground collecting cobwebs spun across furrows and also fibres from a decayed cocoanut palm trunk. No. 936 (4 December) with granular ovary, was one of a pair observed in copula.

According to Ferguson, this Flycatcher breeds in Travancore in April, but from my experience it is evident that it commences doing so considerably earlier. Three of the specimens obtained by Pillai in July and August (Nos. 719, 730 and 755) were immature with imperfectly ossified skulls and all of that period were undergoing heavy post-juvenal or post-nuptial moult.

Leucocirca pectoralis was not met with by the Surveys in the Travancore-Cochin area at all, and one would like to know on what evidence the distribution as given in the *Fauna* (ii, 282) is based.

Family: Laniidae.

Lanius vittatus Valenciennes. The Bay-backed Shrike.

Specimens collected: 613 ♂ 18-4-33, 626 ♂ 19-4-33 Arāmboli 250 ft. Elsewhere not noted.

Colours of bare parts: Iris brown; bill black; legs and feet dark slaty-brown; claws horny-black.

[No other specimens from Travancore seen. The 2 ♂♂ measure:

Bill.	Wing.	Tail.	Tarsus.
18	83.5-84.5	84-88.	22-22.5 mm.

I have now seen enough specimens to be able to say something about the plumages. The sexes of this shrike are alike in colour and size and there is no difference in summer and winter plumage. In the adult there is no spring moult and the autumn moult takes place from July to December beginning with the wings and tail, by which time the body plumage is often in very worn condition. The immature male and female are also of the same size, but the wing and tail are slightly shorter than in adults. The post-juvenal moult takes place about August to November and I have seen it only just beginning as late as 21 December (Mhow). In this are moulted the body plumage, the tertiaries, a variable number of wing-coverts (usually, however, all but the primary coverts with their corresponding smaller coverts) and a variable number of tail feathers (sometimes only the central pair, sometimes all but the two outer pairs).

The first winter plumage is variable. It is normally a slightly duller edition of the adult plumage save for the unmoulted parts of the wings and tail. The black frontal band may, however, be absent, variegated black and

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grey or suggested merely by one or two black feathers. The broad band through the eye from lores to ear-coverts may be rich brown instead of black. The nape, hindneck and mantle may be washed with ashy-grey or more rarely with chestnut. The sides of the breast are sometimes marked with bars and crescents.

When the fully adult plumage is assumed is not clear. Some birds certainly breed in the first winter plumage, but others perhaps moult it before breeding as I have seen a young female with wing and body moult on 5 March.—H. W.]

The Bay-backed Shrike was met by the Surveys at Arāmboli only, and here it was rare. The Arāmboli Gap is a break in the line of the Ghats and forms the thoroughfare between Travancore State and the adjoining Madras district of Tinnevelly. Through this pass several of the typically plains forms wander in. I have already suggested this as the explanation for the highly probable occurrence of *Argya caudata* at Arāmboli, and I consider it more than likely that the presence of the Bay-backed Shrike within Travancore territory is attributable to the same cause. Ferguson also found this species only about Cape Comorin where it had doubtless wandered in from the arid adjoining Madras district unobstructed by the barrier of hills.

The birds were met singly or in pairs frequenting the open scrub country about the bases of the bare rocky hills flanking the 'gap'.

The statement in the *Fauna* (ii, 290) that it occurs in North Travancore needs confirmation. On what authority its alleged occurrence in the Pālni Hills rests is also not known.

It is not found in Ceylon.

Breeding: The testes of both Nos. 613 (18 April) and 626 (19 April) were enlarged to 5×4 and 7×5 mm. respectively and from this, coupled with their fresh plumage, it was evident that they were preparing to breed. The statement in *Nidification* (ii, 257) that 'in Travancore they breed frequently in February and March' conveys the impression that the birds are common in this area, which is the opposite of the case.

Lanius schach caniceps Blyth. The Southern Grey-backed Shrike.

Specimens collected: 67 ♀ 12-1-33 Marāiyūr 3,500 ft.; 910 ♂ 27-11-33 Wadakkāncheri 400 ft.

Elsewhere not noted.

Colours of bare parts: Iris brown; bill horny-black, plumbeous at base of lower mandible and at chin; mouth pale pink; legs, feet and claws blackish-brown.

[The two specimens measure:

	Bill.	Wing.	Tail.	Tarsus.
♂	22.5	92.5	118.5	27.5 mm.
♀	19	93.5	116	28 mm.

Other specimens examined:

B. M. Coll.: ♂ juv. 1-6-77 Shemiganūr 5,000 ft.—Pālnis (Fairbank). ♀ juv. 8-6-77, ♀ 9-6-77 Kodaikanal, Pālnis (Fairbank); ♂ 17-6-77 Lower Pālnis 4,000 ft. (Fairbank).

B. N. H. S. Coll.: ♂ juv. 8-5-93 Kodaikanal (J. P. Cook).—H. W.]

The Grey-backed Shrike is patchily distributed in the Travancore-Cochin area. I came across it only in the above two localities, fairly common at Marāiyūr and somewhat less so at Wadakkāncheri. Ferguson, however, describes it as not uncommon in the plains and says that it also ascends the hills. He had specimens shot in the High Range in February and March.

The birds were met with singly perched on stumps, hedges, bushes and the like in the neighbourhood of cultivation, fallow land or forest clearings. I cannot say if it is a local migrant or a resident species in the area having come across it here only in the cold weather, neither do Ferguson's remarks (*J.B.N.H.S.*, xv, 459) throw any light on the point. Kinloch mentions it as common in the Nelliampathy Hills of Cochin but is silent as to its status there. As Kinloch's list, however, does not include *Lanius cristatus* which, in the cold weather, is certainly the commonest shrike in this region I am

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inclined to suspect that there may perhaps have been some error in his identification. This presumption is further strengthened by the fact that both at Nemmāra (foot of Nelliampathies) and at Pādagiri (3,000 ft. up) the Survey failed to meet this species but on the other hand found *cristatus* quite common.

It is apparently a resident in the Pālni Hills and said to breed there from February to July, though May and June seem to be the best time for eggs (Hume, *N. & E.*, 2nd edition, i, 323-5).

In Ceylon, this shrike is restricted to the Jafna Peninsula and the north-west of the Island.

Breeding: Neither of the Survey specimens showed any gonadal development. According to the *Fauna* (ii, 297) the breeding season in Travancore is March and April; Stewart is said (*Nidification*, ii, 269) to have taken a fine series of eggs in April and May.

Lanius cristatus cristatus Linnaeus. The Brown Shrike.

Specimens collected: 6 ♂ 4-1-33 Marāiyūr 3,500 ft.; 275 ♂ 12-2-33 Thattākād 200 ft.; 327 ♂ 21-2-33 Peermade at 4,000 ft.; 582 ♀ 12-4-33 Cape Comorin; 598 o? 15-4-33 Arāmboli 250 ft.; 888 ♂ 21-11-33 Kūriārkūtti 1,600 ft.; 962 o? 9-12-33 Nemmāra 300 ft.

Elsewhere noted at: Mūnnār (5,000 ft.); Sānthanpāra (3,500 ft.); Kūmili (3,000 ft.); Camp Derāmalāi (3,000 ft.); Rājampāra (1,350 ft.); Tenmalāi (500 ft.); Balamore Estate (2,000 ft.—Ashāmbū Hills); Chālakudi and all along Cochin Forest Tramway; Wadakkāncheri (400 ft.); Pādagiri (3,000 ft.); Karūpadanna (ca. S.L.).

Colours of bare parts: Iris brown; bill, upper mandible and tip of lower horny-brown, rest of lower mandible creamy flesh colour; mouth pale flesh-pink; legs and feet slaty-brown; claws brown.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂	18.5-19	86-89	78-86	24-25.5 mm.
1 ♀	18.5	moult.	77.5	— mm.

In the Survey series the length between the tips of the outer tail feather and the longest tail feather varies from (15) 18-22 mm. Nos. 6, 275, 582, 598 and 962 are adult, the others are not.

In this race the sexes are alike. The amount of rufous wash on the lower parts is variable, a matter merely of individual variation. First winter birds may be recognised from adults by:

(1) the band through the eye from the lores to the ear-coverts is brown not black. (Occasional adults may have the band brown.)

(2) there is less white about the forehead and supercilium,

(3) the much greater amount of crescentic barring on the lower parts,

(4) the retention on the wing-coverts and tertiaries of a certain number of juvenile feathers.

The first winter plumage is probably changed for the fully adult plumage in the first spring.

Adults have a complete moult in both spring and autumn, which takes place in the winter quarters. Summer and winter plumage is alike.—H. W.]

The Brown Shrike is a winter visitor to South India as it is to Ceylon, arriving in early September and leaving towards the end of April. In the Travancore-Cochin area it is common and very generally distributed both in the hills up to at least 7,000 ft. (Kūmarikkāi Malāi!) and throughout the low country. Ferguson seems to have found it mostly from about 2,000 ft. elevation upwards and he considered it rare in the low country. By 27 April, which is the last record I have, its numbers had noticeably decreased.

It was observed singly in every type of country ranging from cultivation and dry scrub or mixed bamboo jungle to the fringe of evergreen forest and often considerable distances within, along cart traces and the like. A favourite haunt is the open grass-covered hillsides dotted here and there with clumps of stunted date palms (*Phœnix farinifera*) which provide useful lookout posts as well as shelters from the heat of the day. The birds were everywhere shy and difficult to approach.

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At Marāiyūr and Wadakkāncheri this shrike and the foregoing were frequently found side by side, and their numbers here were about equal.

The harsh call *chr-r-r-ri* etc. is easily distinguishable from the similar notes of the Grey-backed Shrike.

Hemipus picatus picatus (Sykes). The Black-backed Pied Shrike.

Specimens collected: 464 ♂, 465 o? juv. 18-3-33, 473 ♀ 20-3-33 Rājampāra 1,350 ft.; 968 ♀ 12-12-33, 983 ♂ 15-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Marāiyūr (3,500 ft.); Sānthanpāra (3,500 ft.); Peermade (3,200 ft.); Kūmili (3,000 ft.); Camp Derāmalāi (3,000 ft.); Tenmalāi (500 ft.); Balamore Estate (2,000 ft.—Ashāmbū Hills); Kūvalle Incline (Cochin Forest Tramway).

Colours of bare parts: *Adult*: Iris yellowish-brown; bill horny-black; mouth slaty-pink; legs, feet and claws blackish-brown. *Juvenile* (No. 465): Iris brown; bill horny-brown; mouth yellowish-pink; legs and feet pinkish-brown; claws horny-brown.

[Measurements:

	Bill.	Wing.	Tail.
3 ad. ♂♂	15-16	62-64	57-58 mm.
1 ♀	16.5	62.5	61 mm.

No. 473 is marked as a female with the organs undeveloped. By its glossy black back I should have unhesitatingly considered it an adult male, females and first winter males in other parts of India having a brown back as in No. 968. It is however remarkable that Legge states and in this he is followed by Wait, that in Ceylon the female—and so, therefore, I presume the first winter male—is black-backed like the male. If this is correct, it would certainly be grounds for the recognition of a separate race. Seven skins from Travancore in the British Museum are all black-backed and one of these is labelled ♀.

The adult bird undergoes a complete post-nuptial moult, but there is apparently no pre-nuptial moult.

The juvenile (No. 465) is similar to the brown-backed female but the upper plumage is more a chocolate brown in colour, with some of the feathers lightly edged with white; median and greater coverts dingy white, with subterminal brown bars and other irregular markings; tertiaries edged with dingy white; lower plumage white washed with brown on the breast and flanks. Tail feathers narrower and more pointed than in adult.—H. W.]

The Pied Shrike is, as Ferguson suggests, common in Travancore and this description applies equally to its status in Cochin. The Surveys came across it only between 500 ft. and 3,500 ft. elevation, but it doubtless also occurs higher up. Its favourite haunts are thinned cardamom sholas, the fringe of evergreen jungle or more precisely the transition zone between evergreen and deciduous forest. I did not meet with it in open scrub and bush country either in Travancore or Cochin. The birds move about in pairs or family parties of 3 to 5. In habits they resemble both the Wood-Shrikes (*Tephrodornis*) and the flycatchers, the members following each other from tree to tree, searching among the foliage and sprigs for insects or capturing winged prey by launching graceful sallies after it, turning and twisting in mid-air with great agility. The notes frequently uttered—*whi-ri-ri*, *whi-ri-ri*, *whi-ri-ri-ri* etc.—are very reminiscent of a cheap, squeaky cracker whistle!

In the Pālni Hills, Fairbank records meeting a few; in Ceylon the species is widely distributed.

Breeding: No. 465 (18 March) was a juvenile with very poorly ossified skull and undergoing post-juvenal body moult: the rectrices and remiges were unaffected. No. 464, an adult ♂ from the same family party and evidently parent of the foregoing, had a prominent incubation patch on the abdomen suggesting that both sexes partake in the brooding.

The gonads of the specimens gave no indication as regards the breeding season, all being in normal undeveloped condition.

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Tephrodornis gularis sylvicola Jerdon. The Malabar Wood-Shrike.

Specimens collected: 36-37 ♂♀ 9-1-33 Marāiyūr 3,500 ft.; 127 ♂ 22-1-33 Sānthanpāra 3,500 ft.; 892 ♂ 21-11-33 Kūriārkūtti 1,600 ft.; 982 ♂ 15-12-33, 996 ♀ 19-12-33 Pādagiri 3,000-4,000 ft.

Elsewhere noted at: Thattākād (200 ft.); Ūrūmbikera Reserve Forest near Mūndakāyam (ca. 1,000 ft.); Kūmili and Periyār Lake Environs (3,000 ft.); Camp Derāmalāi (3,000 ft.); Rājampāra (1,350 ft.); Tenmalāi (500 ft.); Balamore Estate (2,000 ft.—Ashāmbū Hills); Wadakkāncheri (400 ft.).

Colours of bare parts: Iris lemon- or greenish-yellow; bill horny-black; mouth greyish-pink (36 and 126), pale creamy yellow and pink (892, 982 and 996); legs and feet plumbeous; claws brown. In No. 37 iris khaki; bill pale horny-brown, paler at gape and chin; mouth greyish-pink; legs, feet and claws as in the others.

[Other specimens examined:
B. M. Coll.: ♀ 18-5-77 Painkadu, 4,000 ft., Lower Palnis (Fairbank).
B. N. H. S. Coll.: ♀ 17-6-93 Palnis (J. P. Cook).

The Survey specimens measure:

	Bill.	Wing.	Tail.
4 ♂♂	25-26	112-117	79.5-83 mm.
2 ♀♀	26-27.5	114-114.5	81-86 mm.

None of the specimens show any moult. No. 892 is a first year ♂ in the plumage of the ♀ and judging by the size of the organs (5×3 mm.) was about to breed in this plumage.—H. W.]

The Malabar Wood-Shrike is common in all evergreen forest tracts throughout the two States and was met with between 200 ft. and 4,000 ft. elevation. It goes about in parties of 5 to 8 birds among tall trees, taking short sailing flights or 'hops' from branch to branch after insects or launching aerial sallies and loops after them like *Culicicapa*, either returning to the same perch or moving from tree to tree. These antics, lithe and graceful, closely resemble those of the White-bellied Drongo and are pretty to watch. Sometimes a bird will momentarily cling to the bark of a tree and pry into the crevices for a lurking insect, at others deftly swoop down and carry it off in its stride. The birds are commonly seen among the mixed assemblies in forest and as the parties move along through the trees the individuals (males only?) utter from time to time a musical *witoo-witoo-witoo* etc. repeated four to six times in quick succession. One bird was observed to capture a thick hairy caterpillar about 2 in. long, which it battered repeatedly against a branch before swallowing.

Fairbank (*S.F.*, v, 400) apparently found this Wood-Shrike common in the Pālni Hills at about 4,500 ft. on the western (humid) side. It does not occur in Ceylon.

Breeding: The testes of No. 892 (21 November) measured 5×3 mm. but none of the other specimens showed any gonadal development, neither was any other evidence as regards breeding obtained.

According to the *Fauna* (ii, 311) J. Stewart in Travancore and A. P. Kinloch in the Nelliampathy Hills of Cochin took nests with eggs from March to June.

Tephrodornis pondicerianus pondicerianus (Gmelin). The Indian Common Wood-Shrike.

Specimens collected: 16 ♂ imm. 5-1-33 Marāiyūr 3,500 ft.; 256 ♀ 9-2-33 Thattākād 200 ft.; 445 ♂ 16-3-33 Rājampāra 1,350 ft.; 568 ♀ 11-4-33 Cape Comorin (S.L.); 697 ♂ 20-7-33 (Thirūmalāi 120 ft.), 704 ♂ 22-7-33 (Museum and Public Gardens ca. 100 ft.), 732 ♂ 26-7-33 (Kūttāni 300 ft.), 754 ♀ 31-7-33 (Akkūlam 150 ft.), 784 ♀ 4-8-33 (Cattle Farm 150 ft.), 803 ♀ 7-8-33 (Golf Links), 849 ♂ 13-8-33 (Nettayam 300 ft.) Trivandrum Town and Talūka; 939 o? 4-12-33, 946 o? 6-12-33 Nemmāra 300 ft.; 1013 ♂ 26-12-33 Karūpadanna ca. S.L.

Elsewhere noted at: Kottāyam (ca. S.L.); Arāmboli (250 ft.); Wadakkāncheri (400 ft.); Trichūr town.

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Colours of bare parts: Iris greenish-brown; bill horny-brown, darker at tips; mouth pink or 'pale yellow, grey and pink' (Pillai); legs and feet slaty-brown; claws brown.

[Owing to moult I can only give measurements of part of the series:

	Bill.	Wing.	Tail.
3 ♂♂	21-22	85.5-89.5	61-61.5 mm.
3 ♀♀	20-20.5	80-88	56-62.5 mm.

Inspite of its small range of colours this species is very variable in tint and has yet hardly segregated into races. Birds from Burma, Calcutta, Dacca, Duars, etc., are very dark in colour and so are Travancore birds, whilst those from Sind, Jodhpur, Punjab, etc. are very pale. The latter have been separated as *pallidus* and if compared with these darker birds of the north-east or south-west *pallidus* appears a very good race. Unfortunately by the usual historical accident, the intermediates between the dark and light forms provide the typical race, and compared with it both pale and dark forms appear hardly separable. As *pallidus* is therefore separable with difficulty, there seems no object in providing the dark form also with a name. Travancore birds show some passage with *T. p. affinis* of Ceylon. They are, however, definitely closer to the typical form and should be kept with it.

This species has a complete post-nuptial moult but no pre-nuptial moult. As the post-nuptial moult in Travancore appears to be very regular, about July-August, the breeding season is no doubt well defined.—H. W.]

Except in the case of Marāiyūr (3,500 ft.), the Common Wood-Shrike was met with by the Surveys only in the lower country from the coast inward up to about 1,500 ft. elevation (usually under 500 ft.), where it is common and apparently a resident. It frequents light deciduous jungle or open scrub-and-bush country, being in this respect the opposite of the foregoing species which is largely coincident with evergreen forest. In localities where there is a mixture of the two forest types, both species were present but the predilection of each for its favourite facies was unmistakable. The mango, jack-fruit, cashew and cocoanut gardens which are such a feature of the homesteads along the backwaters, are also amongst its favourite haunts, and it freely frequents gardens and compounds within town limits.

The birds usually move about in parties of 4 or 5 keeping to trees of moderate height, except in the breeding season when pairs is the rule. The males have a call of several pleasant whistling notes *wheet-wheet* followed by a quick repeated interrogative *whi-whi-whi-whi*? besides which some low trills are uttered in the breeding season.

The common Wood-Shrike apparently does not occur on the Pālni Hills, but as in Travancore and Cochin it may do so at low elevations about their base especially on the eastern (drier) side. In Ceylon it is represented by the endemic race *T. p. affinis* 'from the level of the Plains up to 5,000 ft. and occasionally up to 6,000 ft.' (*Fauna*, ii, 313).

Breeding: The ovary of No. 256 (9 February) was distinctly granular; the testes of 445 (16 March) measured 8×5 mm. and the birds were doubtless breeding at this time. On 13 April (Cape Comorin) a pair were observed building in the fork of a Babool tree in open Babool jungle at about 12 ft. from the ground. The birds were tame and did not mind being watched at close quarters. On 16 April (Arāmboli) a nest with 1 fresh egg was located in the fork of an *Albizzia* tree about 30 feet up. The egg disappeared on the 18th. The owners were observed chasing off from the proximity of their abode a Tree-Pie which had its nest in the same compound about 15 yards away and which undoubtedly knew something about the matter! A couple of days later, a Wood-Shrike (presumably one of the outraged pair) was observed gathering cobwebs for a nest in the same neighbourhood.

From the above and from the fact that the specimens collected in July/August were all in post-nuptial moult, it is evident that the breeding season in the Travancore-Cochin area commences about March and may well go on till June as stated in the *Fauna* (ii, 313).

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Pericrocotus flammeus (Forster). The Orange Minivet.

Specimens collected: 21-22 ♂♀ 6-1-33 Marāiyūr 3,500 ft.; 166-167 ♂♂ 26-1-33 Sānthanpāra 3,500 ft.; 329 ♂ 22-2-33 Peermade 3,200 ft.; 410 ♀ 6-3-33 Kūmili 3,000 ft.; 497 ♂ 26-3-33 Tenmalāi 500 ft.; 925 ♂ 30-11-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Thattākād (200 ft.); Balamore Estate (2,000 ft.—Ashāmbū Hills); Kūriārkūtti (1,600 ft.); Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris brown; bill, legs, feet and claws black ('brownish-slate' in one!); mouth pink, yellowish-pink or 'brown and greyish-pink'; soles of feet yellowish.

[Additional specimens examined:

B. M. Coll.: ♂ ad. 1-6-77, ♂ imm. Shemiganur, Pālnis 5,000-5,500 ft. (Fairbank).

Sparrow Coll.: ♂ ad. 19-3-14, ♂ ad., ♂ imm. 25-3-14 Cardamum Hills.

B. N. H. S. Coll.: ♀ 22-6-93 Pālnis (J. P. Cook).

Also several other Travancore birds in the British Museum.

Travancore specimens measure:

	Bill.	Wing.	Tail.	Tarsus.
6 ad. ♂♂	18-19	90-95	87-93	15.5-16.5 mm.
3 imm. ♂♂	18.5-20	86-95	88.5-90	16 mm.
3 ♀♀	18	91-93	90-96.5	16 mm.

The male in first winter plumage resembles the adult female, but some or occasionally all the yellow of the plumage is a bright orange-saffron tint, quite distinguishable, however, from the flame colour of the adult male plumage.—H. W.]

As recorded for Travancore by F. W. Bourdillon and Ferguson (*J.B.N.H.S.*, xv, 460) the Orange Minivet is common throughout the evergreen forest tracts of the two States from about the low country (Thattākād 200 ft.!) up to at least 4,000 ft. in the hills.

The birds move about in small flocks of from 3 to 7 or 8 individuals, keeping mostly to the leafy tops of tall trees where they search for insects among the sprigs or launch graceful flycatcher-like sallies after them into the air. They are usually present amongst the localised bird associations or mixed itinerant hunting parties in secondary jungle. Their call notes (only males?) are similar to those of *Hemipus* but somewhat irregular and, with a little practice, readily distinguishable from the latter.

Fairbank (*S.F.*, v, 400) describes this Minivet as common in the Pālni Hills at all elevations from the bottom to the summits. It occurs in Ceylon in both hills and plains, but birds from the island are possibly smaller.

Breeding: Already as early as 6 January the gonads appeared to have commenced enlarging; in No. 21 the testes measured 4×3 mm. No. 22 on the same date—one of another pair—had some of the ovarian follicles about 1 mm. in diameter. The testes of 166 (26 January) measured 6×4 mm. and it was in immaculate plumage. No. 329 (22 February) also had equally well-developed testes. In the rest of the specimens there was no gonadal development.

On 12 February (Thattākād) a nest was located on the upper side of a thin horizontal branch at the fork near its extremity, of a *Poon* tree (*Calophyllum wightianum*) at a height of about 40 ft. from the ground. The tree stood by the roadside in fairly open deciduous forest on the fringe of evergreen. The ♀ was brooding.

The nest was a shallow cup plastered on the outside with cobwebs and spiders' egg-cases looking exactly like a knot and harmonising perfectly with the lichen-covered bark of the supporting branch. From the behaviour of the birds at this time—males singing excitedly and chasing females through the tree-tops—breeding appeared to be in progress generally, but the season in this area is possibly a protracted one.

In the Pālni Hills it is said to breed in July (*Fauna*, ii, 322).

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Pericrocotus roseus roseus (Vieillot). The Rosy Minivet.

Not met with by the Surveys, but Ferguson (*J.B.N.H.S.*, xv, 460) though he never came across it himself, records that his collector obtained 2 specimens at an elevation of 2,500 ft. in South Travancore.

Jerdon (*Birds of India*, i, 423) was informed by Lord Arthur Hay that he had seen this species abundantly in the hills dividing Tinnevelly from Travancore and that collections from Travancore always included it. Inspite of this there seems no doubt that this Minivet must be rare in the Travancore-Cochin area.

Pericrocotus peregrinus malabaricus (Gmelin). The Malabar Small Minivet.

Specimens collected: 84-85 ♀♂ 13-1-33 Marāiyūr 3,500 ft.; 253 ♂, 254 o? juv. 9-2-33 Thattākād 200 ft.; 293 ♂ 16-2-33 Ūrūmbikera Forest 1,000 ft.; 443 ♂ 16-3-33 Rājampāra 1,350 ft.; 716 ♂ 24-7-33 (Marūthānkūzhi 50 ft.), 787 ♂ 4-8-33 (Cattle Farm 150 ft.), 809 ♂ 8-8-33 (Mūkūnnimalāi 800 ft.), 818 ♀ 9-8-33 (Nettāyam 200 ft.) Trivandrum Talūk; 926 ♀ 30-11-33, 927 ♂ 1-12-33 Wadakkāncheri 400 ft.; 959 ♀ imm. 9-12-33 Nemmāra 300 ft.; 1027 ♀ 27-12-33 Karūpadanna ca. S.L.

Elsewhere noted at: Sānthanpāra (3,500 ft.); Kottāyam (ca. S.L.); Kūmili and Periyār Lake Environs (3,000 ft.); Balamore Estate (2,000 ft.); Tenmalāi (500 ft.).

Absent at Cape Comorin!

Colours of bare parts: Iris brown; bill blackish-brown to brownish-black; mouth pale flesh to slaty-pink (in immature gape and mouth pale orange-brick colour); legs, feet and claws blackish-brown to brownish-black corresponding with bill.

[Measurements:

	Bill.	Wing.	Tail.
10 ♂♂	12.5-14.5	69.5-74.5	66-74 mm.
4 ♀♀	13.5-14	71-76	67-70 mm.

The only other Travancore specimens are 3 Anjengo birds in the British Museum.—H. W.]

The Small Minivet of the wet Malabar zone, distinguished from other races by its deeper and richer colouration, is common and generally distributed in the low country throughout the two States and may also be found sparingly in the hills up to at least 3,500 ft. It frequents deciduous or the drier mixed forest, rubber plantations, fruit gardens about the backwater homesteads and the like, usually in small flocks of 4 or 5 birds which move along from tree to tree searching the foliage for insects and uttering a feeble *swee-swee* etc.

In Ceylon it is replaced by *P. p. ceylonensis*, a less richly coloured bird.

Breeding: The testes of No. 253 (9 February) had enlarged to 5×3 mm.; it was undergoing complete (pre-nuptial ?) moult in readiness to breed. On 19 February a pair was observed in courtship which consisted largely of the male chasing the female around, uttering a feeble but excited *swee-swee* in a manner similar to that of *P. flammeus*. No. 959 (9 December) was immature with imperfectly ossified skull and in post-juvenal body moult. No. 1027 (27 December) was in freshly moulted immaculate plumage with ovarian follicles distinctly granular and apparently developing.

The specimens obtained in July and August were certainly either breeding or about to. Their gonads were as follows:

716 (24 July) testes 7×4 mm.; 787 (4 August) testes 6×4 mm.; 809 (8 August) testes 8×4 mm.; 818 (9 August) largest ovarian follicle 4 mm. in diameter. All were undergoing pre-nuptial[1] moult except 809 which had lately completed it. The birds, moreover, were in pairs at this time.

[1] In this Mr. Whistler hesitates to agree as he considers that most of the minivets apparently have no pre-nuptial moult. He points out that it is parallel to the case of *P. p. pallidus* of which form he has examined 4 specimens in full moult at the time when they actually had eggs in the nest. He is inclined to suggest that a second brood was brought about when the birds were moulting after the first brood, but the point requires further study.

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The evidence is somewhat confusing, but clearly indicates that breeding commences in February or earlier and that the season is either much protracted or that there is also a second period later on in the year—July to September or thereabouts.

[**Pericrocotus erythropygius** (Jerdon). The White-bellied Minivet.

Not met with by the Surveys, neither recorded by Ferguson in Travancore, Kinloch in the Nelliampathies nor by Fairbank or Terry in the Pālni Hills.

In the *Fauna* (ii, 333) and *Nidification* (ii, 300), however, Mr. J. Stewart is credited with the taking of its eggs in Travancore. I do not know if the record is supported by skins, but if not I feel tempted to doubt its correctness especially since—like many of his other eggs—these were possibly collected for Mr. Stewart by the Māla Pandāram hillmen.]

Lalage sykesi Strickland. The Black-headed Cuckoo Shrike.

Specimens collected: 23 ♂ 6-1-33 Marāiyūr 3,500 ft.; 457 ♂ 17-3-33 Rājampāra 1,350 ft.; 544 ♂ 9-4-33, 561 ♂ 11-4-33 Cape Comorin (ca. S.L.); 731 ♀ 26-7-33 (Kūttāni 300 ft.), 810 ♀ imm. 8-8-33 (Mūkūnni Malāi 800 ft.), 820 ♀ 9-8-33 (Nettāyam 300 ft.) Trivandrum Talūk; 909 ♀ 27-11-33, 922 ♂ 29-11-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Thattākād (200 ft.); Kottāyam (S.L.); Arāmboli (250 ft.); Nemmāra (300 ft.); Karūpadanna (S.L.).

Colours of bare parts: Iris brown; bill horny-brown, paler (yellowish) at base of lower mandible; mouth pink; legs and feet slaty-brown or slaty-black; claws horny-brown. [Iris of immature (No. 810) 'blue-grey' (Pillai).]

[Additional specimen examined:
B. M. Coll.: ♂ 25-2-80 Quilon (Bourdillon).

The Survey specimens measure:

	Bill.	Wing.	Tail.
3 ad. ♂♂	18.5-20.5	102-109	80-83.5 mm.
2 imm. ♂♂	18-19.5	100-101.5	— mm.
2 ad. ♀♀	18.5-19	100-104	76 mm.
2 imm. ♀♀	18-19.5	98.5-103	77.5-83 mm.

This species has no races but there is a certain amount of individual variation in the adult males in which the abdomen may be dark grey, largely white, or dark grey faintly barred. The young male in first winter plumage resembles the adult female.—H. W.]

The Black-headed Cuckoo Shrike is primarily an inhabitant of the low country in Travancore and Cochin. Marāiyūr (3,500 ft.) is the highest elevation at which I came across it, but it was uncommon there. Col. Sparrow met it in the Cardamom Hills in March, at what elevation it is not stated. Below about 1,000 ft. it is common and frequents light deciduous or mixed forest, fruit gardens about the backwater homesteads and such localities, often in association with the mixed hunting parties of Tree Pies, Babblers, Wood-Shrikes, Grey Tits, Woodpeckers and other birds. It is mainly insectivorous, of course, but at Wadakkāncheri (Cochin) I observed it feeding largely on ripe Lantana berries.

We have no information concerning its seasonal movements in this area, if any, but to all appearances it is a resident species.

In view of what is said in the *Fauna* (ii, 341) about its call, it seems worthwhile to point out that it has a pretty 'song' consisting of several clear whistling notes, ending in a quick-repeated *pit-pit-pit*. This, in my version, is certainly not 'the mere repetition of one plaintive note'.

Fairbank procured a ♂ at Periur in the Pālnis but we do not know anything about its numbers or status in those hills. It is apparently a resident in Ceylon and fairly generally distributed, occurring up to 4,000 ft.

Breeding: No indication is afforded by the specimens except that No. 810 (8 August) was immature with imperfectly ossified skull and in post-juvenal body moult. According to *Nidification* (ii, 306) the breeding season in Travancore is April and May.

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Graucalus javensis macei (Lesson). The Large Indian Cuckoo-Shrike.

Specimens collected: 15 ♂ 5-1-33 Marāiyūr 3,500 ft.; 449 ♀ 16-3-33 Rājampāra 1,350 ft.; 718 ♂ 24-7-33 (Pangode 80 ft.), 774 ♀ 2-8-33, 804 ♂, 805 ♀ juv., 806 ♀ juv. 7-8-33 (Golf Links) Trivandrum Environs; 1030 ♂ 28-12-33 Karūpadanna (ca. S.L.).

Elsewhere noted at: Thattākād (200 ft.); Kūmili and Periyār Lake Environs (3,000 ft.); Chālakūdi; Wadakkāncheri (400 ft.); Pādagiri (3,000 ft.—Nelliampathies).

Colours of bare parts: *Adult*: Iris reddish- or orange-brown; bill, legs, feet and claws brownish- or slaty-black; mouth pink. *Juvenile*: 'Iris deep brown; bill slaty, lower mandible paler towards the base; legs ant feet bluish-slate; claws slate; mouth bright reddish-yellow' (Pillai).

[Travancore specimens measure:

	Bill.	Wing.	Tail.	Tarsus.
7 ♂♂	28-29	153-165	111-119	24-25 mm.
4 ♀♀	27-29.5	156-161	108.5-119	23.5-24 mm.

The sequence of plumages has already been detailed in the *J.B.N.H.S.*, xxxvi, 346, so I need only add that adults were undergoing the complete post-nuptial moult in July-August.—H. W.]

The Large Cuckoo-Shrike is a resident in the Travancore-Cochin area, fairly common in the low country up to about 1,000 ft. and somewhat less so upwards to 3,500 ft. which is the highest elevation it was met at. It frequents light deciduous jungle as well as mixed forest on the fringe of evergreen, but seems fondest of rubber plantations and the type of country that obtains around the backwater homesteads. It is usually seen in pairs but also occasionally in small parties of 3 or 4, flying in irregular follow-my-leader fashion above the tree-tops and uttering its distinctive shrill *Tee-eee* calls from time to time.

One of the specimens had captured a large green Mantis.

It appears to be rare in the Pālni Hills. Fairbank (*S.F.*, v, 400) met one at Periur and Terry (*S.F.*, x, 472) came across it in the Pittur Valley. In Ceylon it is represented by the much smaller race *G. j. layardi*.

Breeding: On 7 August (Golf Links, Trivandrum) Pillai found a nest containing 2 fledged young (805 ♀, 806 ♀) ready to leave in 3 or 4 days. The nest was situated in a fork of twigs in a Nim (*Azadirachta indica*) tree at about 25 ft. It is described as 'a neat saucer 4 in. in diameter made of the leaf-stalks of some leguminous tree, fastened together with cobwebs to which were adhering lichens and particles of dry leaves. The bottom of the saucer was strewn with a sort of whitish powdery substance like scales of feather shafts.'

The gonads of all the specimens were in a quiescent state including those of the parent of the chicks (804).

Family: Artamidae.

Artamus fuscus Vieillot. The Ashy Swallow-Shrike.

Specimens collected: 46-47 ♂♂ 9-1-33 Marāiyūr 3,500 ft.; 517 ♂ 5-4-33 (Velayani Lake), 681 ♀ 16-7-33, 712-713 ♀♂ 23-7-33 (Beach), 750 ♂ 30-7-33 (Veli), 788-789 ♀♀ 5-8-33 (Nettāyam), 840-841 ♂♂ (Beach) Trivandrum Town and Environs; 941 unsexed (in alcohol) 5-12-33, 954 unsexed (in alcohol), 955 ♀ 8-12-33 Nemmāra 300 ft.

Elsewhere noted at: Kottāyam (ca. S.L.); Kūmili and Periyār Lake Environs (3,000 ft.); Cape Comorin; Arāmboli (250 ft.); Wadakkāncheri (400 ft.); Karūpadanna (ca. S.L.).

Colours of bare parts: Iris dark brown; bill bluish-grey, black at tips of both mandibles; mouth slate; legs and feet slate; claws black.

[Measurements:

	Bill.	Wing.	Tail.
3 ♂♂	22.5-23	132-133	52.5 mm.
3 ♀♀	21-21.5	130.5-136.5	55-57 mm.

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Moult prevents all the specimens being measured.
Adults undergo a complete moult in July and August.—H. W.]

The Ashy Swallow-Shrike is not uncommon in the low country of Travancore and Cochin, and was also met with sporadically up to 3,000 or 4,000 ft. in the hills. Its favourite biotope, however, is the country along the backwaters, particularly the facies in which *Borassus* and Cocoanut palms predominate. They are usually met gregariously perched on palm trees, telegraph wires and the like whence they fly out from time to time after winged insects, and circle back to their perch. The flight is very swallow-like and consists of several rapid wing beats followed by a graceful effortless sailing.

On a hill at Marāiyūr a congregation of over 30 of these birds was observed all about one particular patch—a glade in mixed bamboo forest. This spot, barely 15 yards square, was discovered to be swarming and alive with thousands upon thousands of the butterfly *Danais melisa dravidarum*. They rested on portions of the foliage of trees in immense clusters that looked exactly like bunches of scorched and withering leaves. Curiously enough, the swarm was confined to this isolated spot and beyond it the species was almost absent. Hundreds of them were preyed upon by spiders—including prominently a *Nephila*—which had spread their webs all over the glade. Whenever the branches were shaken and the shoals of butterflies took wing, the birds descended upon them and wrought destruction. They never took the insects sitting but only hawked them on the wing. Swallow Shrikes were the only bird species interested in these butterflies. Usually when a butterfly is captured in the bill the bird flies back with it to its perch where the wings are pulled off and dropped to the ground before the insect is swallowed, but occasionally this formality is dispensed with and the prey swallowed entire. Frequently the insect is forthwith transferred to the feet, pulled to pieces with the bill and swallowed in mid-air. I also observed that when a swarm of butterflies is on the wing and 'business is brisk', one is caught and promptly transferred to the feet in order that the bill may be free to tackle the second. The bird then flies back to its perch with both its victims and deals with them at its ease.

On the Periyār Lake Swallow Shrikes posted themselves on the dead, partially submerged tree-trunks whence they hawked insects over the surface of the water and also fed largely on butterflies that ventured across from one bank of the lake to the other. Their food seems to consist of butterflies to a very large extent.

In the Pālni Hills Fairbank (*S.F.*, v, 401) obtained this species in thin jungle at 4,500 ft. elevation. It also occurs in Ceylon.

Breeding: The gonads of all the specimens were in normal non-breeding condition, but breeding was obviously in progress in March. On the 4th of that month (Periyār Lake) a pair were observed in copula on a partially submerged tree-stump. The female spread out her wings slightly, gave her body a horizontal stance and 'shivered' in invitation for a second or two. The male flew directly on to her back from a neighbouring perch and balancing himself with his wings completed the act. On 5 April (Trivandrum) a full-fledged young was observed being tended by its parents who beat off a crow encroaching on the neighbourhood.

Pillai's specimen No. 840 (12 August) was evidently not yet fully mature. Its skull was imperfectly ossified, but it was in fresh post-juvenal plumage.

According to the *Fauna* (ii, 349) the Swallow Shrike breeds throughout its wide range during April, May and June, and *Nidification* does not add anything specific for Travancore or Cochin.

Family: Dicruridae.

Dicrurus macrocercus peninsularis Ticehurst. The Black Drongo.

Specimens collected: 298 ♂ 17-2-33 Kottāyam (ca. S.L.); 579 ♀, 580 ♂ juv., 581 ♀ juv. 12-4-33 Cape Comorin (ca. S.L.); 676 ♀ 16-7-33 (Beach), 709 ♂ 22-7-33 (Public Gardens), 715 ♂ 23-7-33, 734 ♂ 27-7-33 (Beach), 817 ♀ 9-8-33, 847 ♂ 13-8-33 (Nettāyam 200 ft.) Trivandrum Town and Environs.

Elsewhere noted at: Vadāserikara (near Rājampāra); Arāmboli (250 ft.); Nāgercoil; all along railway line from Shorānūr to Ernakūlam; Wadakkāncheri

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(400 ft.); Nemmāra (300 ft.); Trichūr Town and Environs; Karūpadanna; Ernakūlam.

Colours of bare parts: *Adult*: Iris reddish-brown; bill, legs, feet and claws black; mouth slaty-brown and pink. *Juvenile*: Iris brown; bill slaty-black; gape cream colour; mouth bright yellow and pink; legs and feet slate; claws horny.

[Additional specimens examined:

Trivandrum Museum Coll.: ♂ first year 15-9-93, ♀ ad. 27-1-81 Trivandrum.

Measurements:

	Bill.	Wing.	Central Tail.	Outer Tail.
4 ad. ♂♂	23.5-26.5	137-147	90-93	134-168 mm.
2 first year ♂♂	—	134-143	98-109.5	131-150 mm.
4 ad. ♀♀	23-26.5	135.5-144	93-98	147-156.5 mm.

Both Indian races of *Dicrurus macrocercus*, namely *albirictus* (Northern India) and *peninsularis* (Southern India) go through the same plumage stages as follows: The juvenile differs from the adult in having

(1) body plumage softer and browner with very little metallic gloss and that confined to the upper plumage,

(2) wings and tail shorter and duller with less gloss,

(3) underwing coverts edged with white; the outer edge of the secondaries may also be narrowly edged with white.

The post-juvenal moult does not include

(1) primaries, secondaries and tertiaries; primary, greater and sometimes a few median coverts; underwing coverts,

(2) tail.

The first winter and summer plumage is distinguished from adult plumage by

(1) the long upper tail coverts are usually edged with white,

(2) the lower plumage is less glossy, the feathers from the lower breast to the under tail coverts being fringed with white to a variable extent; these gradually wear down and in summer are less noticeable,

(3) the duller more faded appearance of the unmoulted parts of the juvenile plumage, and of course the white on the under wing coverts.

This plumage is kept until the autumn when the first complete moult gives fully adult plumage in the second winter.

Adults have a complete post-nuptial moult. They have the under tail coverts occasionally edged with white, but never so the upper tail coverts or the under wing coverts.

Travancore adults are undergoing their post-nuptial moult in July and August.

For a full revision of Indian members of this species see Ticehurst, *J.B.N.H.S.*, xxxvi, 927-9.—H. W.]

The Black Drongo is one of the most familiar birds in the low country of Travancore-Cochin being invariably present—perched on fence posts, telegraph wires and the like—in the neighbourhood of cultivation. It also frequents gardens and compounds in towns and villages and is very partial to the fruit gardens surrounding homesteads along the backwaters, and to the dyked paddy cultivation in this locality. It was not met with anywhere except in open country—often in association with the localised hunting parties of mixed bird species—and nowhere above about 500 ft. elevation.

One was observed capturing on the wing a cream-coloured butterfly (species?).

It does not ascend the Pālni Hills. In Ceylon it is replaced by the smaller race *D. m. minor* which is endemic to the island.

Breeding: By the middle of February (once also on 10 November—Chālakūdi!) the harsh scolding 'duets' or 'trios' so significant of the breeding season were in general evidence. No. 298 (17 February) had testes enlarged to 10×5 mm. and was breeding. Nos. 580 and 581 (12 April) were juvenile ready to leave the nest in a day or so. The nest itself was situated at the base of a Palmyra leaf-stalk about 20 ft. up, and these two comprised the full brood,

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In 579, the mother of the chicks, the ovary was as yet in a conspicuously granular condition and the incubation patch was prominent.

According to T. F. Bourdillon 'eggs may be obtained in any quantities in the low country in June and July' [in Travancore]. He also took eggs in March (*Nidification*, ii, 321).

Dicrurus longicaudatus longicaudatus (Jerdon). The Indian Grey Drongo.

Specimens collected: 14 ♀ 5-1-33, 64 ♀ 11-1-33 Marāiyūr 3,500 ft.; 267 ♂, 268 ♂ 11-2-33 Thattākād 200 ft.; 882 ♀ 18-11-33 Kūriārkūtti 1,600 ft.; 977 ♀ Pādagiri 3,000 ft.

Elsewhere noted at: Peermade (3,200 ft.); Kūmili and Periyār Lake Environs (3,000 ft.); Camp Derāmalāi (3,000 ft.); Nemmāra (300 ft.); Wadakkāncheri (400 ft.).

Colours of bare parts: Iris scarlet or brownish-crimson; mouth greyish flesh colour; bill, legs, feet and claws horny-black.

[Other specimens examined:

Brit. Mus. Coll.: ♀ imm. 11-11-74, ♀ ad. 2-12-78, ♀ ad. 7-12-74, ♂ ad. 7-11-78, ♂ ad. 27-11-78 Mynall, Travancore (Bourdillon).

Trivandrum Mus. Coll.: ♂ 26-12-93 Chimungi; o? -2-99 Ralode [?].

The Survey specimens measure:

	Bill.	Wing.	Central Tail.	Outer Tail.
2 ad. ♂♂	25-25.5	135.5-138.5	89-94.5	149-151.5 mm.
2 ad. ♀♀	25-27	131-138	89.5-92.5	148-148.5 mm.
2 ♀♀ (first winter)	25-26.5	127-127.5	88-89	135-137.5 mm.

In this species the juvenile plumage differs from that of the adult in two important particulars. The body plumage is softer and a browner black, lacking practically all gloss. The wings and tail are as in the adult except for being considerably shorter. The post-juvenal moult does not include the primaries and primary coverts, the secondaries and greater coverts, the tertiaries or tail. These are retained to the following autumn so that first summer and first winter birds differ from adults in their more worn and faded and also shorter wings and tail. They also appear to be slightly paler and less glossy on the abdomen, slight white fringes being more noticeable, especially on the under tail coverts. It is important therefore to remember that in this species the measurements of first year and adult birds must be kept separate if comparison is to be made between the races. This fact has been emphasised by Tiechurst in connection with Burmese birds.

Adults have a complete post-nuptial moult about July-August-September. There is no definite spring moult though odd body feathers are changed.

In *Novitates Zoologicae*, xxv (1918), p. 296, Mr. Stuart Baker named birds from Ceylon as *Dicrurus leucophaeus minimus* on their smaller size. He remarked that 'it appears to be also rather a darker bird than those from Southern India, but the difference is so slight as to be negligible'. The Ceylon bird is, however, a non-breeding migrant, a winter visitor, and in the *Fauna*, vol. ii, p. 364, Mr. Stuart Baker got over this difficulty by fixing the breeding area of *minimus* in the extreme south of Travancore, though in *Nidification*, vol. ii, p. 329, his assurance on this point has weakened. I have seen no evidence that this Drongo is anything but a winter visitor to Travancore, and *D. leucophaeus minimus* appears to me to be based on first year birds of *D. longicaudatus*.—H. W.]

In the hills and wooded areas of the two States, the Black Drongo of the low open country is replaced by this species though I have records only between 13 November and 9 March. It keeps to forest—deciduous, mixed or evergreen—and is especially fond of cardamom sholas and coffee plantations with their shade trees. At Nemmāra and Wadakkāncheri in Cochin, where both the Black and Grey Drongos were found, the former was observed to be restricted to flat open cultivated country while the latter kept to the wooded hills. I cannot confirm Ferguson's statement (*J.B.N.H.S.*, xv, 455) that it is common in the low country of Travancore.

The Grey Drongo is a habitual attendant on the flowers of *Erythrina lithosperma* shade trees and feeds largely on their nectar. Over 10 drops of the

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fluid dripped from the bill of a specimen when held up by its legs. All specimens shot off these flowers, moreover, had pollen adhering to their forehead and chin, and there is no doubt that this species is instrumental in their cross-pollination.

No. 64 had the outermost pair of tail feathers snow-white!

Breeding: There seems to be great uncertainty as regards the status of this Drongo in our area where it is apparently a winter visitor only. No records of its breeding here exist, and the gonads of the Survey specimens, all in a quiescent state, furnish no clue in this regard.

Dicrurus coerulescens coerulescens (Linn.). The White-bellied Drongo.

Specimens collected: 4 ♂ 4-1-33, 73 ♂ 12-1-33 Marāiyūr 3,500 ft.

Elsewhere noted as absent, but a juvenile dated 27-8-93 from 'Kuranmulti, Travancore' [?] by J. P. Cook is in the B.N.H.S. Collection.

Colours of bare parts: Iris reddish-brown; bill horny-black; mouth greyish-pink; legs, feet and claws blackish-brown.

[There are no Travancore specimens in the British Museum. I think it is by no means certain that *leucopygialis* of Ceylon is a race of this species.—H. W.]

At Marāiyūr—the only locality in the Travancore-Cochin area where this Drongo was met—it was noted as a very common and noisy species, inhabiting mixed bamboo forest especially in the neighbourhood of shady paths and clearings. It was often seen in association with the Bronzed Drongo and is an excellent mimic.

Breeding: The testes of the specimens were in normal non-breeding condition. *Nidification* (ii, 331) records that Stewart took its nests in Travancore at about 1,000 ft. and 3,000 ft. elevation. The dates are not mentioned.

Chaptia aenea malayensis Blyth. The Southern Bronzed Drongo.

Specimens collected: 3 ♀ 4-1-33 Marāiyūr 3,500 ft.; 232 ♂ 7-2-33, 263 ♂ 10-2-33 Thattākād 200 ft.; 739 ♀ 29-7-33 (Kūttāni 300 ft.), 797 ♀ 6-8-33, 834 ♂ 4-8-33 (Pūlayanār Kotta 200 ft.) Trivandrum Talūk.

Elsewhere noted at: Sānthanpāra (3,500 ft.); Urumbikera Forest, near Mundakāyam (1,000 ft.); Kottāyam (ca. S.L.); Kumili and Periyār Lake Environs (3,000 ft.); Camp Derāmalāi (3,000 ft.); Rājampāra (1,350 ft.); Chālakudi; Kūriārkūtti (1,600 ft.); Wadakkāncheri (400 ft.); Pādagiri (3,000 ft.—Nelliampathies).

Colours of bare parts: Iris reddish-brown to crimson; bill, legs, feet and claws black; mouth greyish-pink or slaty-pink.

[Other specimens examined:

B. M. Coll.: ♂ 17-6-77 Tandigudi 4,000 ft., Lower Pālnis (Fairbank); ♀ -10-78, ♀ 23-9-74 Mynall, Travancore (Bourdillon).

The presence or absence of white spots on the outer wing coverts appear to me to be a question of individual variation rather than of age.—H. W.]

The Bronzed Drongo is an ubiquitous species in well-wooded tracts throughout the area, both in the low country and in the hills up to least 3,500 ft. and perhaps higher.

Mixed bamboo forest rather than dense evergreen jungle, rubber plantations, cardamom sholas and the groves of mango, cashew and jack fruit, etc., by the backwater homesteads are some of its favourite haunts. They are noisy birds having a large repertoire of loud musical calls and are accomplished mimics besides. They are usually seen singly or in widely separated pairs alongside forest roads, firelines, etc. and often as members of the localised bird associations in forest.

In the Pālnis, Fairbank (*S.F.*, v, 401) considered it one of the commonest birds at the base of the hills and up to 5,000 ft. elevation. It does not extend to Ceylon.

Breeding: Nesting was in progress during February. No. 232 (7 February) had the testes enlarged to 8×4 mm.; 263 (10 February) to 7×4 mm.

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On 11 February (Thattākād) a nest was observed in the process of construction in a young teak plantation. It was a neat round cup of bast fibres, cemented on the outside with cobwebs, wedged in the horizontal fork of a thin bare branch of a teak sapling at about 14 ft. from the ground. One of the owners—apparently male, as calling—was observed turning round and round within to give it shape. No eggs had as yet been laid. The nest was very inconspicuous amongst its surroundings of bare branches and withering leaves, but there seemed to be no deliberate attempt at concealment. The July specimens were undergoing complete post-nuptial moult.

Chibia hottentotta (L.). The Indian Hair-Crested Drongo.

No specimens obtained, neither does Ferguson appear to have come across this species in Travancore. I observed a pair—the only examples in Travancore or Cochin—at Thattākād and have not the slightest doubt as regards their identity since they were watched for a considerable time through field glasses on three consecutive days. The birds were excessively shy, however, and I could never get within gun-shot of them. They kept to a patch of *Erythrina lithosperma* trees with heavy thorny and tangled undergrowth, and fed largely on the nectar of these blossoms, frequently attacking and diving off other birds feeding on adjoining branches.

As no specimens from Travancore apparently exist, it would be interesting to learn on what grounds Mr. Baker has fixed the type locality of his race *hottentotta* as Travancore (*Fauna*, vii, 164). See also *J.B.N.H.S.*, xxxvi, 352.

Breeding: According to Bourdillon (*Nidification*, ii, 321) this drongo breeds in Travancore from the end of February to June. He himself is said to have taken nests from 15 March to 26 April.

[**Dissemurulus lophorinus** (Vieillot). The Ceylon Black Drongo.

The *Fauna* (ii, 373-4) implies that this Drongo is a common bird in Travancore, but since neither Bourdillon, Ferguson nor myself ever came across it there or in Cochin it is difficult to accept the implication until skins can be produced in support. Since the whole claim for its occurrence and breeding in Travancore rests on the possibly vicarious authority of Mr. J. Stewart who, as we know, often had his eggs collected for him and brought in by local hillmen, the doubtfulness of the records becomes all the more heightened.

Nidification (ii, 339) says that in Travancore 'it has been found breeding freely in great numbers by J. Stewart'. All his eggs are said to have been taken between 13 March and 30 April.]

Dissemurus paradiseus malabaricus (Latham). The Malabar Large Racket-tailed Drongo.

Specimens collected: 122 ♂ 22-1-33, 135 ♂ 23-1-33 Sānthanpāra 3,500 ft.; 488 ♂ 24-3-33 Tenmalāi 500 ft.

Elsewhere noted at: Marāiyūr (3,500 ft.); Thattākād (200 ft.); Ūrūmbikera Forest near Mūndakāyam (1,000 ft.); Kūmili and Periyār Lake Environs (3,000 ft.); Camp Derāmalāi (3,000-4,000 ft.); Rājampāra (1,350 ft.); Balamore Estate (2,000 ft.—Ashāmbū Hills); Kūriārkūtti and Parambikolam (1,500-2,500 ft.); Wadakkāncheri (400 ft.); Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris brown to reddish-brown; bill, legs, feet and claws black; mouth slaty-pink (in 135 yellowish-flesh colour).

[Additional material seen:

Brit. Mus. Coll.: ♂ -10-70, ♂ 11-1-76 Mynall, Travancore (Bourdillon).

I do not give measurements as there is some variation in them and I am not yet able to interpret the ages of this species satisfactorily, and shall not be able to do so until I can examine more autumn birds of which the sexing and age determination by skull are satisfactory, so that one is certain one is handling young birds.

There appears to be some instability in the variation of the tail in the juvenile, some apparently having a juvenile tail, others having it similar to the adult. Also I think the races may differ *inter se* in these details. When all these points are worked out one must settle the races.—H. W.]

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The Racket-tailed Drongo is associated with the well-wooded tracts of the States, chiefly mixed bamboo forest or where there is a mingling of the deciduous and evergreen types. It was met with in suitable low country as at Wadakkāncheri and Thattākād and through the foothills up to an elevation of at least 4,000 ft., almost invariably as a member of the localised hunting parties which usually include the Southern Tree Pie and various Flycatchers and Phylloscopi. It is a noisy bird and has a large variety of loud metallic musical notes of its own besides being a very good mimic of other species.

It is common in the Pālni Hills. In Ceylon, according to G. M. Henry (*Ceylon Jour. of Sci.*, Sec. B, Zool. and Geol., xviii, pt. 22 December 1933, p. 146) it is represented in the dry zone by the smaller race *D. p. ceylonensis* while in the wet zone *Dissemurulus lophorinus* completely replaces it.

Breeding: According to Ferguson (*J.B.N.H.S.*, xv, 455) it breeds in Travancore during April and May. From their behaviour I have no doubt that the birds were breeding in March and a specimen shot on the 24th of that month (No. 488) had its testes enlarged to 18×8.5 mm.

The earliest eggs recorded are on 18 February (Stewart), the latest 10 May (Bourdillon). Three eggs usually comprise a full clutch; rarely four (*Nidification*, ii, 349).

(*To be continued*).

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FEEDING OF COBRAS IN CAPTIVITY.

BY

DR. S. G. TSCHERBAKOFF.

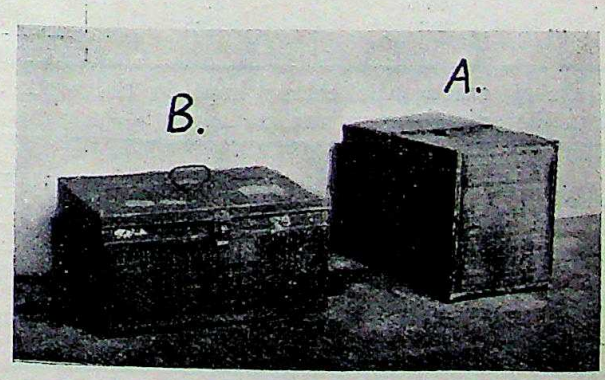
(*From the Haffkine Institute, Bombay*).

As regards the feeding habits of cobras in captivity, there appears to be some difference of opinion among observers. For example, Wall, in his 'Popular Treatise on the common Indian Snakes', mentions that the cobra feeds principally on rats, frogs, toads, and less frequently on birds, and that it seems to show no special preference for any of these creatures under natural conditions. In captivity, however, many specimens feed eagerly and thrive well. Nicholson, on the other hand, in his book on *Indian Snakes* maintains that he has never seen cobras in captivity feed, and unless fed forcibly they would starve themselves to death. An opportunity offered itself during this year, at the Haffkine Institute, to study the feeding habits of cobras in captivity.

An attempt has been made in this paper to record the facts observed during the course of some experiments, carried out to find the best method of feeding cobras.

COBRAS IN CAPTIVITY AT THE HAFFKINE INSTITUTE.

Cobras are received at the Institute from far off places and are despatched in specially designed wooden boxes. As soon as the snakes arrive, they are removed from these boxes and are kept separately, each in a japanned tin box. The tin boxes in use are



Two types of cages for keeping live Snakes.

of two types. Type A measures $52 \times 26 \times 30$ cm.; one of its sides measures 24×28 cm. and is of wire gauze (10 meshes to 2.5 cm.) and nearly half of the top of the box forms a lid which opens and shuts by hinges. Type B measures $45 \times 36 \times 23$ cm.; in this type the two opposite sides of the box are of wire gauze, one measuring

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43 × 21 cm. and the other 43 × 15 cm. (See photograph of types A and B.)

At the time when these experiments were commenced, nearly one half of the snakes were kept in a well ventilated room on the top floor of the Institute, where plenty of air and light could be had. The rest were kept in the animal house in a small room which had no special arrangements for proper ventilation except that the two doorways of the room faced each other. The experiments were carried out during the monsoon months namely from 10th June to 15th October 1934, when the average lowest minimum temperature was about 74° F. and the total rainfall about 70″. On the 1st of June 1934 there were in all 319 cobras (*Naia tripudians*), and these were obtained from the following places:—

Madras	... 268	Narasingpore	... 4
Mysore	... 19	Raibanore	... 21
Wardha	... 5	Gwalior	... 2

From June to September 1934, 131 cobras died in captivity, the mortality among these being distributed as follows:—

June	1934	...	58
July	,,	...	29
August	,,	...	22
Sept.	,,	...	22

The records of the Colaba observatory for the corresponding dates are as follows:—

Month	Highest maximum temperature during the month	Lowest minimum temperature during the month	Total rainfall during the month
June 1934 ...	93·5°	74·7°	29·06″
July ,, ...	88·8	72·9	22·74
August ,, ...	86·6	73·9	12·14
Sept. ,, ...	89·0	73·5	5·83
			69·77″

The mortality among the cobras kept in the well ventilated room and in the animal house was as follows:—

Where housed	No. of Cobras on 1st July 1934	Died			Total died	Percentage Mortality
		July	Aug.	Sept.		
Upstairs ...	113	9	12	8	29	25·7
Animal House.	148	20	10	14	44	30·0

Experiments on the Feeding of Cobras.

The methods employed for the feeding of cobras in these experiments were so devised as to obtain comparative results.

Experiment I. One hundred cobras were fed with live rats. The rats selected for this purpose were the Bombay *Rattus rattus*, which are sent to the Institute daily by the Municipality of Bom-

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bay for the detection of plague. These rats were kept under observation for several days to ensure that they were free from any natural infection. The rats selected weighed from 30 to 70 grams; and according to the size of the cobra the weight of the rat used varied. A live rat was dropped into the cage of each cobra. After 24 hours it was noticed that only 27 cobras had swallowed the rats. Fifty-five rats were killed but not eaten, and these were removed from the cages as they began to decompose. Eighteeen rats were found alive although they had been with the cobras for 24 hours; and some of these were removed from the cages. It was also noticed that the rats which were left alive in the cages for longer periods continued to live for a period of five days; during this period, driven by hunger, they started to nibble at the cobras, and therefore they had to be removed.

During the course of this experiment it was noticed that when a cobra struck at a live rat, the rat died within one and a half to three minutes. In no case did the survival period exceed four minutes. When the cobra saw its prey dead, it commenced to swallow it by working its teeth and lower jaw until the prey was gradually forced in, and in about three minutes the entire rat disappeared from view. During the process of swallowing the epiglottis was often projected forwards to take in air and thus prevent suffocation. Also during the process of swallowing the whole body of the cobra remained stationary; but immediately the prey disappeared down its throat, the cobra began to make a somewhat circular movement and within a very short time (about three minutes) the prey reached its destination, namely the region of the stomach. This circular movement was repeated over and over again at intervals of a few minutes. After about half an hour the cobra retired to a corner of the cage and remained coiled up. It was observed that before retiring to the corner the cobra made peculiar movements suggesting that it was searching for something. It was thought that this might be a drink of water. So a plate full of water was introduced into the cage. The cobra drank very freely and since then the practice of giving water to the cobras after each feed has been continued. In these experiments it was noticed that it took on the average five days for a cobra to digest a live rat.

Experiment II. One hundred cobras were fed on dead rats. These rats were killed by drowning in a pail of water and were immediately placed in the cages. Only 28 cobras swallowed the rats.

Experiment III. One hundred cobras were given about 30 grams each of minced beef bought fresh. In only 18 cases did this method of feeding prove successful.

Experiment IV. Next a whole hen's egg was placed in each of 25 cages. The snakes did not seem to take notice of the eggs and all the eggs remained entire even after five days.

Experiment V. One hundred cobras were fed as follows:—Rats were killed by drowning and were cut in two longitudinally and all the internal organs removed. From 30 to 50 grams of this cut-up meat were placed in each of the hundred cages. Thirty-seven cobras fed successfully by this method.

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It was also noticed that when a cobra failed to swallow the cut-up meat within three hours of its being offered, it very rarely ate; and only in a very few cases was this meat eaten up to within six hours. In all these experiments the food left uneaten was removed after 24 hours of its introduction into the cages. It was observed that a cobra took three days to digest a cut-up rat.

During the experiments it was observed that all the cobras did not behave alike with regard to their feeding. According to their feeding behaviour they can be divided into three groups.

Group 1. Those that refused to feed at all. The behaviour of cobras Nos. 313 and 329 in the following table are cited as examples to illustrate this.

Cobra 313		
30-6-34	...	L —
3-7-34	...	L —
19-7-34	...	D —
31 7-34	...	M —
1-8-34	...	C —
10-8-34	...	C —
20-8-34	...	C —
30-8-34	...	C —
10-9-34	...	C —

Cobra 329		
27-6-34	...	L —
30-6-34	...	L —
2-7-34	...	C —
20-7-34	...	C —
31-7-34	...	M —
1-8-34	...	C —
10-8-34	...	C —
20-8-34	...	C —
30-8-34	...	C —
10-9-34	...	C —
14-9-34	...	L —

Note: (—) Means refused to eat.
L means Live rat;
D ,, Dead rat;
M ,, Meat;
C ,, Cut-up rat.

Group 2. Those that fed upon rats in any form—whether alive, dead or dissected, and on meat (beef). The behaviour of cobras Nos. 321 and 372 in the following table are cited as examples to illustrate this.

Cobra 321		
2-7-34	L	*
19-7-34	D	*
31-7-34	M	*
10-8-34	C	*
20-8-34	C	*
30-8-34	C	*
10-9-34	C	*

Cobra 372		
27-6-34	L	*
6-7-34	D	*
20-7-34	C	*
1-8-34	C	*
7-8-34	M	*
22-8-34	C	*
3-9-34	C	*
14-9-34	C	*
15-9-34	L	*
18-9-34	L	*
19-9-34	L	*
20-9-34	L	*
21-9-34	L	*

Note: * means positive feeding or fed successfully.

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Group 3. Those that preferred only one type of food either a live rat or a dissected one. (a) The behaviour of cobras Nos. 29 and 115 in the following table illustrates the results obtained with dissected rats.

Cobra 29		
23-6-34	L	—
26-6 34	L	—
9-7-34	D	—
25-7-34	C	*
3-8-34	C	*
13-8-34	C	*
25-8-34	C	*
4-9-34	C	*
19-9-34	C	*

Cobra 115		
19-6-34	C	*
2-7-34	L	—
9-7-34	D	—
14-7-34	L	—
25-7-34	C	*
7-8-34	C	—
17-8-34	L	—
27-8-34	C	*
10-9-34	C	*
21-9-34	C	*

(b) The behaviour of cobras Nos. 18 and 220 in the following table illustrates the results obtained with live rats.

Cobra 18		
26-6-34	L	*
9-7-34	D	—
25-7-34	C	—
3-8-34	C	—
13-8-34	L	*
25-8-34	C	—
4-9-34	L	*
11-9-34	L	*

Cobra 220		
23-6-34	L	*
16-7-34	D	—
27-7-34	C	—
7-8-34	M	—
13-8-34	L	*
17-8-34	C	—
30-8-34	C	—
4-9-34	L	*

The following table shows the combined results obtained by the various methods employed for the feeding of cobras from 16-6-1934 to 25-7-1934.

Methods of feeding cobras with	No. of observations made	Percentage of successful feedings
Live rats	200	25
Dead rats (drowned) ...	200	24
Dissected rats ...	195	37
Beef meat	200	15

Since then *over one thousand observations* have been made with dissected rats, and the results have shown the average percentage of successful feedings by this method to be 33.

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The snakes that refused to feed had to be forcibly fed. The method employed at the Institute prior to these experiments, consisted in pouring down the gullet of the cobra a mixture of egg and milk. On an average each cobra received about 30 cc. of egg content and 40 cc. of milk. When this was given it was observed that about 33 per cent of cobras thus fed vomited almost the entire quantity within 5 to 15 minutes of their feeding. Therefore a change was made in the mixture by increasing the amount of egg content to 45 cc. and decreasing the quantity of milk to 20 cc. By employing this method it was observed that only about 10 per cent of the cobras vomited after feeding.

Mortality among Cobras and its Relationship to Feeding.

As most of the deaths among the cobras were due to starvation, the results of these feeding experiments with special reference to mortality among cobras have been arranged under four groups.

Group 1. In this group are included all those cobras that fed successfully each time they were supplied with food. During the course of this experiment nine attempts were made at feeding each cobra with dissected rats. Among the 33 cobras thus fed, there was not a single death until the 15th October 1934 (the period of starvation).

Group 2. In this group of 68 cases, most of the feedings were successful. During the period of observation 10 died giving a percentage mortality of 14·7.

If groups 1 and 2 are combined they give a percentage mortality of only 10.

Group 3. In this group are included those cases where the cobras fed only once and then refused to feed when six or seven attempts at feeding them were made. Out of 17 cobras 9 died with a percentage mortality of 53.

Group 4. All the 160 cobras in this group did not feed at all of their own accord and therefore had to be forcibly fed with egg and milk. The number of deaths in this group was 80 giving a percentage mortality of 50.

If groups 3 and 4 are combined they give a percentage mortality of 50·3.

The above results seemed to indicate that the method of feeding cobras in captivity with dissected rats was not only attended with a larger percentage of successful feedings, but was quite safe since there was not a single death (during the period of five months' observation) among the cobras thus fed, thus showing that there was not appreciable injury caused by the swallowing of exposed bones in the dissected rats.

The Frequency with which Cobras could Feed.

During the course of these experiments an attempt was made to study how much and how often a cobra would feed. Wall relates instances regarding the voracious nature of some snakes in

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captivity. This was found to be the case with some cobras as the following table well illustrates.

Case No.	17-9-1934	18-9-1934	19-9-1934	20-9-1914	21-9-1934	22-9-1934	23-9-1934	24-9-1934	25-9-1934	26-9-1934	27-9-1934	28-9-1934	29-9-1934	30-9-1934	1-10-1934	2-10-1934	3-10-1934	4-10-1934	5-10-1934	6-10-1934	7-10-1934	8-10-1934
390	*	*	*	–	–	.	.	–	*	*	*	*	.	.	.	*	*	*	*	.	.	*
391	*	*	*	–	–	.	.	–	*	*	*	*	.	.	.	*	*	*	*	.	.	*
392	*	–	–	*	–	.	.	*	*	*	*	*	.	.	.	–	–	–	–	.	.	–
397	*	–	–	*	–	.	.	–	*	–	–	–	.	.	.	*	–	–	–	.	.	*

Note.—* means positive feeding ;
– ,, negative feeding or not fed ;
. ,, feeding not carried out.

From 25-9-1934 to 8-10-1934, cobras 390 and 391 fed almost on all successive days, the break in daily feeding being unavoidable on account of holidays.

Relation between Feeding and the Yield of Venom.

Dowsett mentions that snakes in captivity lose the greater part of their venom. Experiments carried out here did not support this view.

The method employed at the Institute was that as soon as the cobras were received, their venom was extracted and then they were forcibly fed with a ration of milk and eggs. Afterwards they were fed periodically and venom was extracted at intervals of two weeks.

Experiment VI. Between July 12th and July 25th, 1934, on first extraction an yield of 34·680 grams of dry venom was obtained from 233 cobras, giving an average of 0·149 grams per cobra. The venom was dried over calcium chloride in vacuo.

At the second extraction between July 26th and August 11, 1934, of the above group, out of which 6 had died during the interval, 36·270 grams of dry venom was obtained from 227 cobras, giving an average of 0·160 grams per cobra.

At the third extraction between August 14 and September 20, 1934, the above group, out of which 22 had died, gave 40·445 grams dry venom, showing an average yield of 0·198 grams per cobra.

From 8th to 27th September, 1934, experiments were carried out with two groups A and B, each of which consisted of 50 cobras.

Group A, consisting of cobras which regularly and successively fed on rats, yielded 12·020 grams dry venom, whereas

Group B, comprising cobras which refused to feed and had to be forcibly fed, yielded 8·275 grams dry venom.

This showed that cobras when properly fed, especially with rats, yield an increased quantity of venom.

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In another group of 36 snakes which were received at the Institute as follows:—

November 1933	11
December	7
January 1934	4
March	10
April	1
May	2
June	1

the total venom yield on *first extraction* was 6·247 grams. These snakes were feeding regularly and the extraction of the venom took place at regular intervals of 2 to 3 weeks. The total venom on final extraction in September 1934 was 8·105 grams. All cobras in this group were fed successfully with rats.

Yet in another group, 31 cobras were forcibly fed on milk and egg. They were received at the Institute as under:

November 1933	9
December	10
March 1934	10
April	2

On first extraction they gave 7·305 grams dry venom and finally in September 1934 they yielded only 6·485 grams.

All the above experiments seemed to indicate that proper feeding increased the quantity of venom or at least kept up to the initial yield.

In the course of these experiments the maximum yield of fresh venom which was obtained from one cobra was 1·750 grams and from another the minimum yield was 0·040 grams.

The maximum yield of dry venom was 0·530 grams and the minimum 0·010 grams.

Some interesting observations were made during these experiments. These are (1) cobras thrive when housed in a dry and well ventilated room; (2) they drink water freely after a feed; and (3) black cobras are the easiest to feed.

Summary.

1. Feeding cobras in captivity with dissected rats gave the largest percentage of positive or successful feeding. This method was found to be quite safe.

2. In some cases it seemed necessary to feed cobras with dissected rats as well as with live rats.

3. At times cobras exhibited individual idiosyncrasies and it was necessary therefore to feed them on that type of food which they preferred.

4. With cobras which fed well in captivity the yield of venom during one year compared favourably with that obtained when the cobra arrived first at the laboratory.

5. Even from starving cobras a certain amount of venom could be collected till their death.

6. A cobra took about three days to digest a dissected rat and about five days to digest a live rat.

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7. As regards the time when cobras should be fed it appeared that, when extraction of venom was attempted, they were best fed with dissected rats once in ten days and venom extracted after seven days from the time of the feeding, as immediately after a feed the yield of venom became considerably less. At least an interval of three days seemed necessary between the extraction of venom and the next feed.

I take this opportunity to express my deep indebtedness to Lieut.-Col. S. S. Sokhey, I.M.S., the Director of the Haffkine Institute for the facilities placed at my disposal for carrying out this piece of study. My thanks are also due to Dr. B. P. B. Naidu, Dr. P. M. Wagle and Rao Bahadur Dr. G. D. Chitre for assistance rendered in several ways during the course of these experiments, and to Dr. S. C. Roy, Meteorologist, Bombay, for the information about temperature and rainfall.

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THE BUTTERFLIES OF THE NILGIRI DISTRICT.

BY

J. A. YATES.

In his enumeration of local lists of butterflies, Evans (*Identification of Indian Butterflies*, 2nd edition) mentions Sir George Hampson's list published in the *Journal of the Royal Asiatic Society*, 1888. I venture in the subjoined list to revise his list, both by giving the names as in Evans and by adding butterflies taken subsequently. Brigadier Evans has been good enough to let me see his copy of Hampson's list, with additions made by Stokes Roberts in manuscript. I have also been able to consult Col. Winckworth's list, verified by specimens in his collection. Hampson's excellent description of the area requires no modification. Lastly both Brigadier Evans and Mr. Gabriel of the Entomological Department, British Museum, kindly helped me to verify the fact that certain species have been found in the Nilgiris. These I have specially noted in the following list.

The Nilgiris are popular with collectors, both schoolboy and adult. I thought therefore it might be of service to both classes of collectors to give them a revised list.

I should add that Brigadier Evans thinks that one or two changes will have to be made in nomenclature. He has kindly permitted me to include some of his latest conclusions: notably under *Padraona*, where *Padraona pseudomaesa pseudomaesa* M. replaces *Padraona cato cato* Evans, and *Padraona pallida pallida* Evans replaces *Padraona pseudomaesa pseudomaesa* M. The *Baoris* group will eventually be split up, I understand; but meanwhile one may note that the form described as *B. mathias* var. *agna* M. (D. S. F.) is now definitely considered as a species.

I have rearranged Hampson's list to make it tally with Evans'. The numbers in brackets are Hampson's original numbers. Where no number occurs the inclusion of a species is due to Stokes Roberts or to Winckworth, or to its being in the British Museum collection.

A. PAPILIONIDAE.

A1.

(193) 1*b*. **Troides helena minos** Cr.

A2.

(197) 8*b*. **Tros jophon pandiyana** M.
(198) 9. **Tros hector** L.
(199) 10*b*. **Tros aristolochiae aristolochiae** F.

A3.

(195) 5*b*. **Chilasa clytia clytia** L.
(194) 5*b*. **Chilasa clytia *var.* dissimilis** L.

A4.

(206) 1*b*. **Papilio polymnestor polymnestor** Cr.
(205) 10*a*. **Papilio paris tamilana** M.

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(203) 13. **Papilio crino** F.
(294) 14. **Papilio buddha** Wd.
(196) 16. **Papilio dravidarum** Wm.
(202) 19*b*. **Papilio helenus daksha** M.
(201) 25*a*. **Papilio polytes romulus** G.
'The three forms of the female occur.' (Hampson)
(212) 26*a*. **Papilio demolion liomedon** M.
(200) 27*a*. **Papilio demoleus demoleus** L.

A5.
(207) 4*a*. **Pathysa nomius nomius** Esp.

A6.
(208) 2*a*. **Zetides sarpedon teredon** Fd.
(210) 3*b*. **Zetides doson eleius** Fr.
(211) 8*a*. **Zetides agamemnon menides** Fruh.

(*Note*.—I can find no record of *Pathysa antiphates naira* M. as from the Nilgiris.)

B. Pieridae.

B1.
(157) *a*. **Leptosia nina nina** F.

B4.
(184) 10*a*. **Pieris canidia canis** Evans.

B6.
(192) 3. **Delias eucharis** Drury.

B7.
2. **Prioneris sita** Fd. (B. M., Crowley).

B8.
(188) *b*. **Belenois mesentina mesentina** Cr.

B9.
(185, 186) 2*a*. **Huphina nerissa evagete** Cr.
(187) 3*b*. **Huphina nadina remba** M.

B10.
(176) 3*b*. **Appias indra shiva** Swin.
(183) 4*a*. **Appias libythea libythea** F.
(182) 5*b*. **Appias lyncida latifasciata** M.
6*b*. **Appias albina darada** Fd. (Winckworth) ♀ *var*. **semiflava** (Winckworth).
(177-181) 7*b*. **Appias paulina wardi** M.

B11.
(162) 1. **Catopsilia crocale** Cr.
(161) 2. **Catopsilia pomona** F.
♀ *var*. **catilla** Cr.
(164) 4. **Catopsilia pyranthe minna** Herbst.
(163) 5. **Catopsilia florella gnoma** F.

B15.
(159) 1. **Terias drona**. Hors. (*T. libythea* F., in Evans' list).
(160) 2*a*. **Terias laeta laeta** Bdv.
(158) 4*a*. **Terias blanda silhetana** Wall.
(158) 5*a*. **Terias hecabe simulata** M.
5*a*. **Terias andersoni ormistoni** Watkins (B. M., Moore, Watson, Broughton).

B16.
(175) 5*a*. **Colias hyale nilagiriensis** Fd.

B17.
(167, 168) 1. **Ixias marianne** Cr.
(165, 166) 2*b*. **Ixias pyrene frequens** But.

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B18.
(173) 1*a*. **Colotis amata modesta** But.
(174) 4*a*. **Colotis fausta fulvia** Wall.
(171) 5*b*. **Colotis etrida etrida** Bdv.
(170) 6. **Colotis aurora** Cr. (=*C. eucharis*, F., in Evans' list).
(172) 7*a*. **Colotis danae danae** F.

B19.
(169) *b*. **Hebomoia glaucippe australis** But.

B20.
(189, 190) 2*a*. **Pareronia ceylanica ceylanica** Fd.
(191) 3. **Pareronia valeria hippia** F.

C. Danaidae.

C1.
(1) 1*b*. **Hestia lynceus malabarica** M.

C2.
(6) 1*a*. **Danais aglea aglea** Cr.
(7) 7. **Danais nilgiriensis** M.
(2) 9. **Danais limniace mutina** Fruh.
(3) 10*b*. **Danais melissa dravidarum** Fruh.
(5) 12. **Danais plexippus** L.
(4) 15. **Danais chrysippus** L. *var.* **alcippoides** M.

C3.
(9) 7*b*. **Euploea core core** Cr.
(10) 12*b*. **Euploea coreta coreta** God.
(8) 18*b*. **Euploea crassa kollari** Fd.

D. Satyridae.

D2.
(11) 3*a*. **Mycalesis anaxias anaxias** Hew.
(18) 9*a*. **Mycalesis perseus typhius** Fruh.
(14) 10*a*. **Mycalesis mineus polydecta** Cr.
11. **Mycalesis igilia** Fruh. (Winckworth).
(14) 12*a*. **Mycalesis visala visala** M.
15. **Mycalesis khasia orcha** Evans.
(15) 20. **Mycalesis adolphei** Guer.
14. **Mycalesis subdita** M. (Winckworth).
(16) 32*b*. **Mycalesis patnia junonia** But.

D3.
(17) 21*a*. **Lethe europa ragalva** Fruh.
(19) 22*a*. **Lethe rohria nilgiriensis** Guer.
(18) 23*b*. **Lethe drypetis todara** M.

D14.
(22) 6. **Ypthima asterope mahratta** M.
(25) 9. **Ypthima chenui** Guer.
(23) 11*a*. **Ypthima hubneri hubneri** Kirby.
(24) 10. **Ypthima ceylonica** Hew.
(21) 13*b*. **Ypthima avanta striata** Hamp.
14*a*. **Ypthima baldus madrasa** Evans.
(26) 14*a*. **Ypthima philomela tabella** Mar. and DeN.

D15.
(27) 1. **Zipoetis satis** Hew.

D16.
(12) *a*. **Orsotrioena medus mandata** M.

D22.
(30) 1. **Melanitis leda ismene** Cr.
(28, 29) 2*b*. **Melanitis phedima varaha** M.
(31) 3*a*. **Melanitis zitenius gokala** M.

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D25.
(32) 1*b*. **Elymnias hypermnestra caudata** But.

E. Amathusiidae.

E10.
(33) 3*b*. **Discophora lepida lepida** M.

P. Nymphalidae.

F1.
(83) 2*b*. **Charaxes polyxena imna** But.
(82) 7*b*. **Charaxes fabius fabius** F.

F2.
(18) 2*a*. **Eriboea athamas agrarius** Swin.

F7.
(44) 8*b*. **Apatura parisatis atacinus** Fruh.

F10.
(39) 1*a*. **Euripus consimilis meridionalis** WM.

F18.
(73) 3*a*. **Euthalia lepidea miyana** Fruh.
(74) 14*b*. **Euthalia garuda meridionalis** Fruh.
(75) 17*b*. **Euthalia lubentina arasada** Fruh.
(72) 27*b*. **Euthalia evelina laudabilis** Swin.
(71) 28. **Euthalia nais** Forst.

F20.
(65) *b*. **Parthenos sylvia virens** M.

F24.
(66) 7*b*. **Limenitis procris undifragus** Fruh.

F25.
(70) 2*a*. **Pantoporia nefte inara** Db.
(69) 4*a*. **Pantoporia selenophora kanara** Evans.
(68) 10*a*. **Pantoporia ranga karwara** Fruh.
(67) 14. **Pantoporia perius** L.

F26.
(57) 1*a*. **Neptis columella nilgirica** M.
(58) 2*b*. **Neptis jumbah jumbah** M.
(53, 54) 6*a*. **Neptis hylas varmona** M.
(55) 7*a*. **Neptis soma kallaura** M.
(56) 8*a*. **Neptis nandina hampsoni** M.
(52) 26*a*. **Neptis viraja kanara** Evans.
(51) 32*b*. **Neptis hordonia hordonia** Stoll.

F27.
(79) 4*a*. **Cyrestis thyodamas indica** Evans.

F30.
(63) 1. **Hypolimnas misippus** L.
♀ *var*. **alcippoides** But.
♀ *var*. **inaria** Cr.
(62) 2. **Hypolimnas bolina** L.

F33.
b. **Doleschallia bisaltide malabarica** Fruh. (Stokes Roberts).

F34.
(80) 1*b*. **Kallima philarchus horsfieldii** Koll.

F35.
(49) 1*a*. **Precis hierta hierta** F.
(50) 2*a*. **Precis orithyia swinhœi** But.
(48) 3*a*. **Precis lemonias vaisya** Fruh.
(46) 4*a*. **Precis almana almana** L.

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(47) 5. **Precis atlites** L.
(45) 6*a*. **Precis iphita pluviatalis** Fruh.

F36.
(76) 1. **Vanessa cardui** L.
(77) 3*a*. **Vanessa indica pholae** Fruh.
(78) 4*b*. **Vanessa canace viridis** Evans.

F39.
(64) 1*g*. **Argynnis hyperbius hybrida** Evans.

F41.
(40) *b*. **Cupha erymanthis maja** Fruh.

F42.
(41) 1. **Atella phalanta** Drury,

F44.
(43) *b*. **Cynthia erota saloma** Swin.

F45.
(59, 60, 61) 4*b*. **Cirrochroa thais thais** F.

F47.
(42) 2*b*. **Cethosia nietneri mahratta** M.

F48.
(38) **Byblia ilithyia** Drury.

F49.
(37) 1*b*. **Ergolis ariadne indica** M.
(35, 36) 2*b*. **Ergolis merione merione** Cr.

F52.
(34) **Telchinia violae** Fab.

H. Erycinidae.

G1.
(85) 2*a*. **Libythea lepita lepitoides** M.
(84) 3*b*. **Libythea myrrha carma** Fruh.

G4.
(86) 5*b*. **Abisara echerius suffusa** M.

H. Lycaenidae.

H8.
(87) *a*. **Spalgis epius** Wd.

H10.
(123) *a*. **Talicada nyseus nyseus** Guer.

H11.
(106) 1*a*. **Castalius rosimon rosimon** F.
(105) 2*b*. **Castalius caleta decidia** Hew.
(107) 3*a*. **Castalius ethion ethion** Db. and Hew.

H12.
(108) 1. **Tarucus ananda** DeN.
(104) 9. **Tarucus nara** Koll.

H13.
(103) **Syntarucus plinius** F.

H14.
(101) 1. **Azanus ubaldus** Cr.
(102) 4. **Azanus jesous gamra** Led.

H17.
(88) **Neopithecops zalmora** But.

H18.
(109) 5*a*. **Everes parrhasius parrhasius** F.

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H20.
(89) *a*. **Megisba malaya thwaitesi** M.

H21.
(91) 2*b*. **Lycaenopsis puspa gisca** Fruh.
(91) 2. **Lycaenopsis lilacea** Hamp.
(92) 10. **Lycaenopsis albidisca** M.
(94) 14. **Lycaenopsis akasa mavisa** Fruh.
(93) 19*b*. **Lycaenopsis lavendularis limbata** M.

H23.
(95, 96) *a*. **Chilades laius laius** Cr.

H24.
(97) 1*a*. **Zizeeria trochilus putli** Koll.
(100) 3*a*. **Zizeeria maha ossa** Swin.
4. **Zizeeria lysimon** Hub (Stokes Roberts).
(98) 5. **Zizeeria gaika** Trimen.
(99) 6*a*. **Zizeeria otis discreta** But.

H25.
(119) 1. **Euchrysops cnejus** F.
2*b*. **Euchrysops contracta contracta** But. (B.M.).
3*a*. **Euchrysops pandava pandava** Hors. (Stokes Roberts).

H26.
(111) 2*a*. **Lycaenesthes lycaenina lycaenina** Wd.

H27.
(118) 1. **Catachrysops strabo** F.

H28.
(120) **Lampides boeticus** L.

H29.
(110) 1*a*. **Jamides bochus bochus** Cr.
(121) 5*b*. **Jamides celeno celeno** Cr.
(122) 9*b*. **Jamides alecto eurysaces** Fruh.

H32.
(118) 3*a*. **Nacaduba hermus nabo** Fruh.
(114) 7*a*. **Nacaduba helicon viola** M.
(112) 8*b*. **Nacaduba kurava euplea** Fruh.
9*b*. **Nacaduba beroe gythion** Fruh. (B. M., Watson and Moore).
(115) 15*a*. **Nacaduba nora nora** Fd.
(115) 16*a*. **Nacaduba dubiosa indica** Evans.
(117) 17*b*. **Nacaduba noreia hampsoni** DeN.
(117) 19. **Nacaduba dana** DeN.

H44.
(90) 1. **Curetis thetis** Drury.
6. **Curetis acuta dentata** M. (Stokes Roberts).

H45.
(129) 1*b*. **Iraota timoleon arsaces** Fruh.

H46.
(155) 1*b*. **Horsfieldia anita dina** Fruh.

H47.
a. **Thaduka multicaudata kanara** Evans (Stokes Roberts).

H49.
(156) 33. **Amblypodia canaraica** M.
39*a*. **Amblypodia amantes amantes** Hew. (Stokes Roberts).

H50.
(154) 1*b*. **Surendra quercetorum biplagiata** But. (=*S. todara* of Hampson).
(138) 4*a*. **Surendra todara todara** M. (=*Rapala distorta* of Hampson).

H53.
(151, 152) *b*. **Loxura atymnus atymnus** Cr.

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H57.
(139) 1*b*. **Spindasis vulcanus vulcanus** F.
2. **Spindasis schistacea** M. (Winckworth).
(144) 4. **Spindasis abnormis** M.
6*b*. **Spindasis ictis ictis** Hew. (B. M., Moore, etc.).
(141) 7*b*. **Spindasis elima elima** M.
(142) 13*a*. **Spindasis lohita lazularia** M.

H58.
(132) **Zesius chrysomallus** Hub.

H59.
4*a*. **Pratapa blanka sudica** Evans. (Stokes Roberts).
(145) 8. **Pratapa cleobis** God.

H60.
(147) 8. **Tajuria melastigma** De.N
18. **Tajuria jehana** M. (Winckworth).
(146) 19. **Tajuria cippus cippus** F.
23. **Tajuria maculata** Hew. (Stokes Roberts, in DeNiceville collection).

H61.
(127) 1*a*. **Charana jalindra macarita** Fr.

H70.
(148) *b*. **Cheritra freja jaffra** But.

H76.
(128) **Rathinda amor** F.

H77.
(125) 1*a*. **Horaga onyx cingalensis** M.
(126) 4. **Horaga viola** M.

H78.
(124) 1*a*. **Catapoecilma elegans myosotina** Fruh.

H80.
(149) 1. **Hypolycaena nilgirica** M.

H81.
(150) **Zeltus etolus** F.

H83.
(130) 1*a*. **Deudoryx epijarbas epijarbas** M.

H84.
(134) 1. **Virachola isocrates** F.
(135) 2*a*. **Virachola perse ghela** Fruh.

H85.
(131) 6. **Rapala lankana** M.
(136) 11*a*. **Rapala varuna lazulina** M.
(137) 12. **Rapala schistacea** M.
(133) 16. **Rapala melampus** Cr.

H87.
(153) *a*. **Bindahara phocides moorei** Fruh.

I. Hesperiidae.

I1.
7*b*. **Hasora badra badra** M. (B. M., Moore).
(217) 15*a*. **Hasora taminatus taminatus** Hub.
(218) 16. **Hasora alexis alexis** F.

I2.
(216) 8*a*. **Ismene ajina fergusoni** DeN.
(215) 17*a*. **Ismene gomata kanara** Evans.

I3.
(219) *a*. **Bibasis sena sena** M.

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I4.
(214) 4*a*. **Choaspes benjaminii benjaminii** Guer.

I5.
(213) **Badamia exclamationis** Fab.

I11.
(263) 3. **Celaenorrhinus ambareesa** M.
(260) 16*b*. **Celaenorrhinus leucocera leucocera** Koll.
(261) 20*a*. **Celaenorrhinus ruficornis area** Pl.

I14.
(259) 3*a*. **Tagiades obscurus athos** Pl.
(258) 10*b*. **Tagiades litigiosa litigiosa** Mosch.

I19.
6*a*. **Daimio bhagava bhagava** M. (Winckworth).

I20.
(268) 1*a*. **Coladenia dan dan** F.
(269) 2*b*. **Coladenia indrani indra** Evans.

I21.
(274, 275) 3*b*. **Sarangesa dasahara davidsoni** Swin.

I23.
(272) *b*. **Tapena thwaitesi hampsoni** El. and Ed.

I25.
(273) 1. **Odontoptilum angulata sura** Fd.

I26.
(270) 1*a*. **Caprona ransonnettii ransonnetti** Ed.
1*b*. **Caprona ransonnettii lanka** Evans.
1*g*. **Caprona ransonnettii taylorii** DeN.

I27.
(255) *a*. **Gomalia elma albofasciata** M.

I28.
(256) 2. **Syrichtus galba** F.

I41.
(220) 1*b*. **Baracus vittatus subditus** M.
(221) 2. **Baracus hampsoni** El. and Ed.

I42.
(243) 1. **Ampittia dioscorides** F.

I43.
(246) 9. **Aeromachus pygmaeus** F.

I45.
(252, 253, 254) 1. **Arnetta vindhiana** M.

I46.
(222) 2*a*. **Iambrix salsala luteipalpus** Plotz.

I47.
(231) 1*b*. **Suastus gremius gremius** F.
(232) 3*a*. **Suastus rama bipunctus** Swin.

I51.
(223) *a*. **Sancus pulligo subfasciatus** M.

I57.
(267) 1. **Udaspes folus** Cr.

I58.
(264) 4*a*. **Notocrypta paralysos alysia** Evans.
(265) 6. **Notocrypta curvifascia** Fd.

I59.
(225) 1*b*. **Gangara thyrsis thyrsis** F.

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164.
(224) 1. **Matapa aria** M.

166.
(257) 1*a*. **Hyarotis adrastus adrastus** Cr.
(266) 2. **Hyarotis basiflava** DeN.

183.
2. **Halpe hyrtacus** DeN. (B. M.).
(251) 15. **Halpe astigmata** Swin.
(249) 18*a*. **Halpe sitala sitala** DeN.
(250) 20. **Halpe honorei** DeN.
(247) 31*a*. **Halpe moorei moorei** Watson.
(248) 33*a*. **Halpe egena ceylonica** M.

187.
(242) *a*. **Cupitha purreea purreea** M.

188.
(245) 2*b*. **Taractrocera maevius sagara** M.
(244) 3*a*. **Taractrocera ceramas ceramas** Hew.

189.
1. **Oriens concinna** El. and Ed. (B. M., Hampson).
(241) 3*a*. **Oriens goloides** M.

190.
(239) 9*a*. **Padraona pseudomaesa pseudomaesa** M. (*syn.* cato.).
10*a*. **Padraona pallida pallida** Evans.
(240) **Padraona tropica diana** Evans.
15*a*. **Padraona palnia palnia** Evans.
(All these, from the Nilgiris, are in the British Museum.)

191.
1*a*. **Telicota augias augias** L. (Stokes Roberts) (=*Astycus*, Hubner, found to be preoccupiel).
(237) 2*a*. **Telicota lanka** Evans.

197.
1*b*. **Baoris oceia farri** M. (Winckworth).
(226) 14*b*. **Baoris kumara kumara** M.
15*b*. **Baoris philippina belli** Nov. (Winckworth).
(227) 20. **Baoris contigua** Mab.
(228) 24*a*. **Baoris conjuncta narooa** M.
(236) 30*a*. **Baoris sinensis subochracea** M.
(234) 31*b*. **Baoris mathias mathias** F.
(235) 31*b*. **Baoris agna** M.
(230) 32*b*. **Baoris guttatus bada** M.
33*b*. **Baoris zelleri cinnara** Wallace (Stokes Roberts).
(229) 34*b*. **Baoris bevani bevani** M.

The totals for the Nilgiri District are:—

Papilionidae	...	...	18
Pieridae	...	...	32
Danaidae	...	...	10
Satyridae	...	...	25
Amathusiidae	...	...	1
Nymphalidae	...	...	47
Erycinidae	...	...	3
Lycaenidae	...	...	80
Hesperiidae	...	...	66
			282

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I have had the curiosity to compare the lists for the Nilgiri District and Coorg and to tabulate the butterflies found in the one area, but not in the other. They are as follows:—

Nilgiri District.	Coorg.
**Colias hyale nilagiriensis.*	*Pathysa antiphates naira.*
**Pieris canidia canis.*	*Parantirrhoea marshalli.*
Mycalesis visala visala.	*Eriboea schreiberi wardi.*
Ypthima avanta striata.	*Euthalia telchinia.*
Ypthima philomela tabella.	*Atella alcippe mercea.*
**Argynnis hyperbius hybrida.*	*Gerydus biggsii.*
Azanus jesous gamra.	*Lycaenesthes emolus emolus.*
Lycaenopsis albidisca.	*Nacaduba pactolus continentalis.*
Lycaenopsis lavendularis limbata.	*Amblypodia centaurus pirama.*
Iraota timoleon arsaces.	*Amblypodia bazaloides.*
Spindasis elima elima.	*Amblypodia abseus indicus.*
Tajuria melastigma.	*Apharitis lilacinus.*
Tajuria maculata.	*Pratapa deva deva* (one ♀).
Hypolycaena nilgirica.	*Chliaria othona.*
Gomalia elma albofasciata.	*Astictopterus jama mercara.*
Baracus vittatus subditus.	*Kineta microstictum.*
	Plastingia submaculata kanara.
	Baoris canaraica.
Total 16	Total 18

In the two lists there are only three species from the Nilgiris, viz.: those asterisked, all palaearctics, that are never likely to occur in Coorg, for the very good reason that Coorg is not sufficiently high. There are others in the Nilgiri list that are not very likely to occur in Coorg, again chiefly for the reason of insufficient altitude, though it is not impossible that they should be found on the higher hills of the western rim of Coorg: these are *Y. philomela tabella, L. albidisca, N. lavendularis limbata,* and *Baracus vittatus subditus. Y. chenui* and *Mycalesis adolphei,* both common in the Nilgiri District, are rare on the higher points of the Coorg Ghats. The rest in the Nilgiri list should be discoverable in Coorg: some, e.g. *Azanus jesous, Iraota timoleon, Spindasis elima,* and *Gomalia elma* are all found on the Mysore plateau, which extends its forest into eastern and southern Coorg. The two *Tajuria* and *Hypolycaena nilgirica* will, if found, I think be found in the wet forest of the Ghats.

Of the list of species found in Coorg, but not so far in the Nilgiri District, there is none that may not turn up in the Nilgiris, if the artificial boundaries of the District are overleapt and the natural region, including the densely forested western and south-western slopes of the hills, be searched. Hampson confined himself, it would seem, to the Nilgiri District, the boundary of which, above the forests of Nilambur, runs along the hill tops, and does not include that long spur, called the Camel's Hump on the maps, which runs south between Vayittri and Nilambur. Again, while the District includes the eastern part of the Wynaad, the natural

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region would take in the western part including the Vayittri Ghat to Calicut. This arbitrary exclusion of large parts of the natural area probably accounts for the absence of many, if not most, of the species in this exclusive Coorg list. It may be observed that the Coorg boundary on the west and south-west runs along the foot of the hills and so takes in the forest where most of the rare species are to be found. I may particularise *Amblypodia bazaloides*, *Amblypodia abseus indicus*, *Gerydus biggsii*, *Kineta microstictum*, as examples of wet forest specimens. *Astictopterus jama mercara* was taken by Col. Winckworth on the Vayittri Ghat: and Col. Fraser and Col. Winckworth took also *Parantirrhoea marshalli* there. *Pathysa antiphates naira*, not recorded from the Nilgiri District, will probably be found within the natural area of the Nilgiris.

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THE MEDICINAL AND POISONOUS FERNS OF INDIA.

BY

J. F. CAIUS, S.J., F.L.S.

The FILICES are a very large and important family of plants consisting of about 170 genera and upwards of 3,500 species. They are distributed all over the globe, although they find their head-quarters in tropical America and tropical Asia. Even the Arctic zone is not excluded. They are found at all elevations, from 10,000 to 12,000 feet in the Tropics, down to the sea level.

The medicinal and poisonous ferns of the world belong to 44 genera:—ACROSTICHUM (Tropical America); ACTINIOPTERIS (North Africa, Mascarene Islands, Persia, Afghanistan, India, Ceylon); ADIANTUM (Cosmopolitan, especially tropical America); ALSOPHILA (South Australia); ASPIDIUM (Tropical regions); ASPLENIUM (Cosmopolitan); ATHYRIUM (Cosmopolitan); BALANTIUM (Cape Verde, Canary Islands, Madeira, Azores); BLECHNUM (Tropical America); BOTRYCHIUM (Cosmopolitan); CERATOPTERIS (Tropical countries); CHEILANTHES (Tropical and temperate regions, xerophytic); CIBOTIUM (Tropical America, Polynesia, Asia); CYCLOPHORUS (Tropical countries); CYSTOPTERIS (Temperate regions); DAVALLIA (South Spain, Portugal, Azores, Madeira, Canary Islands, Cape Verde); DICKSONIA (Australia); DRYMOGLOSSUM (Tropical regions); DRYNARIA (Palaeo-tropics); DRYOPTERIS (Northern temperate regions); GLEICHENIA (Tropical and subtropical regions); GYMNOGRAMME (Central America; xerophytic); HELMINTHOSTACHYS (Ceylon, Himalaya to Queensland); HEMIDICTYUM (India, Western Asia, Europe, North-West Africa); LOMARIA (India, Ceylon, Philippine Islands, Fiji, New Zealand, South Australia, Tasmania); LYGODIUM (Tropical Asia, Eastern Asia); MARSILIA (Europe and subtropical regions); MERTENSIA (Tropical and subtropical countries); MOHRIA (East Africa, Madagascar); NEPHRODIUM (Northern temperate regions); NEPHROLEPIS (Tropical and subtropical regions); NOTHOCLAENA (Subtropical regions, Mediterranean); ONOCLEA (East Asia, North America); OPHIOGLOSSUM (Tropical and temperate regions); OSMUNDA (Temperate and tropical countries); PELLAEA (Subtropical regions); PLEOPELTIS (Tropical and subtropical regions); POLYPODIUM (Tropical and temperate regions); POLYSTICHUM (Moist temperate regions); PTERIDIUM (Cosmopolitan); PTERIS (Cosmopolitan); SCOLOPENDRIUM (Europe, Asia); STENOLOMA (India, Ceylon, Malaya, China, Japan, Polynesia, East African Islands); WOODWARDIA (Tropical and subtropical regions).

The medicinal and poisonous ferns of India belong to the following 24 genera:—ACTINIOPTERIS, ADIANTUM, ASPIDIUM, ASPLENIUM, ATHYRIUM, BLECHNUM, BOTRYCHIUM, CERATOPTERIS, CHEILANTHES, CIBOTIUM, CYSTOPTERIS, DRYMOGLOSSUM, DRYNARIA, DRYOPTERIS, GLEICHENIA, HELMINTHOSTACHYS, HEMIDICTYUM, LYGODIUM,

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OPHIOGLOSSUM, OSMUNDA, PELLAEA, PLEOPELTIS, PTERIS, STENOLOMA.

I. *Gleicheniaceae*—Sori dorsal, without indusium, composed of a few sporangia having a transverse or obliquely transverse complete ring and opening vertically.
Caudex creeping; stipes forked; segments small, almost round or pectinate ... ... GLEICHENIA.

II. *Dicksonieae*—Sori globose; indusium inferior subglobose, free, closed, at length bursting irregularly, more frequently cup-shaped, entire or with 2 lips.
Indusium apical on a vein 2-valved ... ... CIBOTIUM.

III. *Davallieae*—Indusium squamiform, suborbicular or tubular, open at the apex.
a. Indusium apical, compound, sub-orbicular, only open at the top ... ... STENOLOMA.
b. Indusium medial on a vein membranaceous, hood-like ... ... CYSTOPTERIS.

IV. *Pterideae*—Indusium oblong or linear, formed of the more or less changed and reflexed margin of the frond, opening inwardly.
a. Indusium globose to linear, usually many and distinct, sometimes confluent and continuous bearing the capsules on its under side; veins free ... ... ADIANTUM.
b. Indusium rounded and distinct, or more or less confluent but not continuous; capsules on the frond ... ... CHEILANTHES.
c. Indusium quite continuous, sori at first dot-like, but soon running into a line ... ... PELLAEA.
d. Indusium quite continuous; sori linear continuous, occupying a slender filiform receptacle in the axis of the indusium; veins free ... ... PTERIS.
e. As in *Pteris*, but veins all anastomosing without free included veinlets ... ... DRYOPTERIS.
f. Anomalous ... ... CERATOPTERIS.

V. *Blechneae*—Indusium linear or oblong parallel with the midrib and opening towards it, not near the margin.
Indusium membranaceous, distinct from the margin of the frond, parallel with and usually contiguous to the midrib, veins free ... ... BLECHNUM.

VI. *Asplenieae*—Indusium linear or oblong or horseshoe-shaped, opening towards the midrib, sometimes double; sori attached to the veins.
a. Indusium linear or oblong, single; vein free ... ASPLENIUM.
b. Indusium linear or oblong, more or less curved. ATHYRIUM.
c. Indusium linear or oblong; veins anastomosing obliquely only towards margin of frond ... HEMIDICTYUM.
d. Indusium linear elongated, submarginal, fronds fan-like ... ... ACTINIOPTERIS.

VII. *Aspidieae*—Indusium superior, elliptical, subglobose or reniform, fixed either by the centre or a sinus.
Indusium peltate, orbicular or reniform; veins copiously anastomosing with free included veinlets ... ASPIDIUM.

VIII. *Polypodieae*—Sori on the back of the lobes, round or rarely somewhat oblong.
a. Fronds with the base oak-leaf-like or with separate sterile oak-leaf-like small fronds ... ... DRYNARIA.

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b. Fronds various; veins copiously anastomosing with free included veinlets ... ... PLEOPELTIS.

IX. *Grammitideae*—Sori on the back of the lobes more than twice as long as broad, usually linear.
Sori in a continuous linear, or interrupted central or submarginal line, veins reticulated, fronds simple and dimorphous ... ... DRYMOGLOSSUM.

X. *Osmundaceae*—Capsules 2-valved, opening across the apex, furnished with a short horizontal ring ... OSMUNDA.

XI. *Schizaeaceae*—Capsules 2-valved, opening down the side crowned by a complete operculiform ring.
Capsule solitary in the axils of large imbricating clasping involucres. Scandent ... ... LYGODIUM.

XII. *Ophioglossaceae*—Capsules deeply 2-valved, opening down the side nearly to the base without a ring.
a. Capsules sessile in 2 rows on a narrow close spike OPHIOGLOSSUM.
b. Capsules in small crested clusters forming a loose spike ... ... HELMINTHOSTACHYS.
c. Capsules in 2 rows on the face of spikes which form a compound panicle ... ... BOTRYCHIUM.

The parts used medicinally are the fronds and the rhizomes. The former are often aromatic, and they are commonly given in infusion for their mucilaginous, pectoral, and astringent properties. On the other hand, the rhizomes usually contain a bitter astringent principle together with a fixed oil which is poisonous to worms.

The common Male Fern, or Shield Fern, which has been known from the times of Theophrastus and Dioscorides as a specific remedy for intestinal worms, particularly the tape worm, is official in all pharmacopoeias. The true Maidenhair Fern is official in Belgium, Portugal, Switzerland, and Turkey. The Canadian Maidenhair and the common Hart's Tongue are recognized by the French Codex, and several species of Polypody Ferns are still retained in the Austrian pharmacopoeia.

ACTINIOPTERIS.

This genus consists of a single species, ***A. dichotoma*** Bedd., which resembles a miniature palm. It is found throughout India, especially the Peninsula, in dry rocky places, below 4,000 ft. From Ceylon to the Mascarene Islands, Maarlisberg, Zambesiland, Angola, Upper Egypt, Abyssinia, Socotra, Mount Sinai, Arabia, Persia, Afghanistan.

It is used medicinally as a worm remedy, and as an astringent to arrest hemorrhage.

Bombay: Bhuitad, Mapursika, Mayursikha—; *English*: Peacock's Tail—; *North-Western Provinces*: Morpach, Morpankhi—; *Sanskrit*: Mayurshikha—.

ADIANTUM.

This cosmopolitan genus numbers about 190 species, mostly tropical American.

Tradition has attributed to various species of this genus of ferns valuable properties in chronic pulmonic catarrhs.

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The following species are used medicinally in Europe, Indo-China, Mexico—*A. capillus-veneris* Linn.—; in China—*A. capillus-veneris* Linn., *A. flabellulatum* Linn., *A. monochlamys* Eat.—; in North America—*A. capillus-veneris* Linn., *A. pedatum* Linn.—; in Brazil—*A. cuneatum* Langsd. and Fisch., *A. radiatum* Linn., *A. subcordatum* Sw., *A. tenerum* Sw.—; in South Africa and La Reunion—*A. capillus-veneris* Linn., *A. aethiopicum* Linn.—.

The fronds of *A. pedatum* Linn. are officinal in France; those of *A. capillus-veneris* Linn. in Belgium, Portugal, Switzerland, Turkey.

Nine therapeutically active species may be found growing in India.

I. Frond simply pinnate, rachis rooting at the apex.	
a. Pinnae half-moon shaped, distinctly stalked, ¾-½ inch by 1½-1 inch. Texture herbaceous	1. *A. lunulatum.*
b. Pinnae wedge-shaped at the base, nearly sessile, ½-¾ inch by ¼ inch. Texture leathery ...	2. *A. caudatum.*
II. Frond at least bipinnate; segments fan-shaped with the stalk near the centre; sori oblong or obversely kidney-shaped.	
a. Pinnules firm, membranaceous-chartaceous, glabrous, scarcely ever or but slightly 2-3 lobed, fertile lobes with 2, rarely 3 notches, each notch bearing a rather large sorus at the bottom	3. *A. venustum.*
b. Sori roundish or transversely oblong.	
i. Pinnules distinctly wedge-shaped at the base. Sori in shallow depressions of the lobes.	
† Pinnules deciduous	4. *A. tenerum.*
†† Pinnules not deciduous	5. *A. capillus-veneris.*
ii. Pinnules roundish, being straight, almost wedge-shaped or rounded at the base. Sori in deep hollows of the lobes	6. *A. aethiopicum.*
c. Sori obversely kidney-shaped in deep round hollows of the lobes	7. *A. cuneatum.*
III. Frond dichotomous	8. *A. pedatum.*
IV. Frond flabellate	9. *A. flabellulatum.*

1. **Adiantum lunulatum** Burm. This very graceful fern occurs throughout Northern India in moist places; in South India it is very general on the western side in the plains and lower slopes of the hills. It is found in Burma, Ceylon, the Malay Peninsula, Perak, Cochin-China, China, Hongkong, Polynesia, Tropical Australia. It extends to Cape Verde Isles, Angola, Guinea, Zambesiland, Madagascar. In Tropical America it grows from Mexico southward to the Organ Mountains in Brazil.

Ayurvedists describe the plant as pungent, cooling, alterative, alexiteric, and indigestible. They consider it useful in dysentery, diseases of the blood, ulcers, erysipelas, burning sensations, and epileptic fits. They recommend the rhizome for strangury and for fever due to elephantiasis.

In general the fronds are considered to be deobstruent, diuretic, emmenagogue, resolvent and pectoral. As a pectoral they are used in pulmonary catarrh. They are also demulcent

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and mildly stimulant. As a discutient their plaster is a useful application on chronic gouty and other swellings. Burnt with oil they are used as an application for itch.

In Gujerat the plant is extensively used in the treatment of children for febrile affections. The leaves are rubbed with water and given with sugar. The herbaceous parts pounded with ochre are applied topically for erysipelatous inflammations.

Arabic: Shirulajibala—; *Bengal*: Goyalelata, Kalijhant—; *Bombay*: Hansraj, Hansaraj, Kombada, Mubarak, Ratakombada, Rajahans—; *Canarese*: Navalad—; *Gujerati*: Hanspadi, Hansraj, Mubarkha, Mubarkhinipalo—; *Hindi*: Hansapadi, Hansapagi, Kalijhamp, Kalijhant, Paresiyavasan—; *Ilocano*: Dalipaco—; *Marathi*: Ghodkhuri, Hansari, Kamsaraj, Rajhans—; *Persian*: Parasiyavashana—; *Philippines*: Culantrillo—; *Porebunder*: Hansraj, Kalohansraj—; *Sanskrit*: Brahmadani, Chitrapada, Dharttarashtrapadi, Ghritamandalika, Godhangri, Godhapadika, Hansaghri, Hansapadi, Hansavati, Karnati, Kiramata, Kirapadika, Kitamari, Madhusrava, Padangi, Raktapadi, Sancharini, Shitangi, Sutapadika, Suvuka, Tamrapadi, Tridala, Tripadi, Triphala, Vikranta, Vishvagranthi—; *Tagalog*: Caicai, Gayomanmanoc, Lamotlamotan, Lomotlomotan—.

2. **Adiantum caudatum** Linn. occurs throughout India, Ceylon, and the Malay Peninsula in the plains and lower slopes of the hills. It extends to Java, Borneo, the Philippine Islands, China, and Arabia Felix. It is also found in the Cape Verde Islands, the banks of the Niger, Angola, Zambesiland, the Cape Colony, and Mauritius.

The fronds are used as a cure for cough and fever. They are also employed externally as a remedy for skin diseases.

Cutch: Mayurshika—; *Punjab*: Adhsaritakajhari, Gunkiri—; *Sanskrit*: Mayurashikha—.

3. **Adiantum venustum** Don. is a common Himalayan fern distributed from Afghanistan, through Kashmir and the Punjab, to Nepal. Blanford says this is 'one of the commonest and most abundant ferns of Simla, covering banks and sloping ground in shady places, and ranging from 4,500 ft. up to the top of Hattu at 10,500 ft.' It grows in the soil in forest, often forming for miles the most characteristic under-vegetation.

This maidenhair is a famous Yunani drug, and at one time it used to be exported in cartloads from Jaunsar, along the cart-road to Saharanpur, for some medicinal purpose. Mahommedan writers describe the fronds of the plant as slightly bitter, resolvent, deobstruent, expectorant, diuretic, emmenagogue, purgative, aphrodisiac, and alexipharmic. They consider them useful in biliousness, phlegmatic humours, inflammations, diseases of the chest, colds, headache, tumours, ophthalmia, and hydrophobia. They prepare an oil which they apply to piles, tuberculous glands, and wounds, and also 'to bring out a thorn which has penetrated into the body'. The leaves made into a plaster are applied topically to chronic tumours of various kinds.

There is no doubt as to this fern possessing astringent and aromatic properties, and being emetic in large doses. It is a tonic, febrifuge, and expectorant. The plant is very useful as a mild tonic, especially during convalescence from fevers. A vapour bath

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medicated by a decoction from the leaves of this fern is regarded as useful in fever.

In Chamba the plant is pounded and applied to bruises.

It is this fern which supplies in the Punjab most of the *hansraj* which is commonly administered as an anodyne in bronchitis, and is considered diuretic and emmenagogue.

As an ointment it is used for the prevention of hair from falling. The ashes of the plant mixed with olive oil and vinegar are used to make the hair grow upon the bald patches produced by ringworm of the scalp.

The plant is one of the ingredients in Sushruta's Vidaryadi-gana recommended for the treatment of scorpion sting. On the other hand Yogaratnakara, Nighantaratnakara, and Brihannighantaratnakara advise macerating the rhizome and putting the juice and pulp into the ear of the patient. But from their experimental work with mice Caius and Mhaskar have concluded that no part of the plant is an antidote to scorpion venom.

Arabic: Kuzburatelbir, Masifelaswad, Sakelasward, Shaerelfual, Shaereljibal, Shiruljibal, Shiruljinn—; *Bombay*: Mubarak—; *Hindi*: Hansraj, Kalijhanp, Kalijhant—; *Persian*: Hansraj, Paresiyawashan, Parsiawashan—; *Sanskrit*: Hansapadi—; *Tamil*: Mayirsikki—; *Urdu*: Mobarkha, Parsia ushan—.

4. **Adiantum tenerum** Sw. is found in Mexico and the West Indian Islands, southwards to Juan Fernandez and Peru. One solitary specimen was collected in Sion Wood, Bombay Island, by Blatter and d'Almeida, and regarded as an escape from cultivation.

The plant is demulcent, expectorant, and sudorific. It is much used in Brazil in bronchial and catarrhal affections.

5. **Adiantum capillus-veneris** Linn. appears to be found all over India, where circumstances are favourable; shade and permanent moisture being essentials. It occurs chiefly in the Western Himalaya, ascending to an altitude of 8,000 ft.; but found also far to the east in the valley of Manipur, extending to the mountains of the Burma-Manipur frontier and to Chittagong. It is common in the Punjab, descending even to the plains, where it is found in wells and damp places. It is also quite common in South India, in the Bombay and Madras Presidencies, particularly on the west side up to 5,000 ft. It is rare in Ceylon, but extends to Polynesia, Japan, and South-Eastern China. Through Afghanistan and Baluchistan it finds its way to Arabia, Syria, Siberia, the Caucasus, Central and Southern Europe, South-West England, Isle of Man, and Ireland. It is also met with in the Canary Islands and in many parts of the African Continent, both North and South. It extends from Florida, southward to Venezuela and the Amazon Valley.

In the Punjab, the leaves along with pepper, are administered as a febrifuge; and in South India, when prepared with honey, they are used in catarrhal affections.

The herb is mucilaginous, pectoral, and expectorant; and is used as a popular cough medicine throughout most parts of

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Europe. It has also been used to stimulate menstrual discharges. It is given in the form of infusion, sweetened with sugar or honey.

In France large quantities are employed in the preparation of *Sirop de Capillaire*, which is given as a favourite medicine in all coughs, throat affections, and bronchial disorders. It is flavoured with orange flowers, and acts as a demulcent with slightly stimulating effects. One part of the plant is gently boiled with ten parts of water, and with nineteen parts of white sugar. Dr. Johnson, says Boswell, used to put *Capillaire* into his port wine. Sir John Hill used to say that the fine syrup made in France from that Fern is not by any means to be thought a trifle, because barley water, sweetened with this, is one of the very best remedies for a violent cold.

'The True Maidenhair,' says Gerard, 'maketh the hair of the head and beard to grow that is fallen and pulled off.'

The Basutos smoke the leaf for head and chest colds.

In Southern California the plant is much used as an astringent, expectorant, and emmenagogue.

At Colomas, in Mexico, the leaf is used as a tea to relieve colic; but at Colothan it is taken as a tea for the absence or abnormal stoppage of the menses.

The rhizome is the part used in Persian medicine; it is credited with expectorant properties and is given for relieving difficult respiration.

Arabic: Shairuljin, Shiruljin—; *Catalan*: Capillera, Falsia—; *Colombia*: Cilantrillo, Culantrillo—; *Dutch*: Venushaar, Vrouhenhaar—; *Egypt*: Kuzbaret-el-bir—; *English*: Maidenhair Fern, Maria's Fern, Our Lady's Hair—; *French*: Adiante, Adianthe, Capillaire, Capillaire commun, Capillaire d'Italie, Capillaire de Montpellier, Capillaire vrai, Cheveux de Vénus—; *German*: Frauenhaar, Venushaar—; *Greek*: Adianton—; *Gujarati*: Hanspadi—; *Hindi*: Hansraj, Mubaraka, Pursha—; *Indo-China*: Duoi chon, Thiet tuyen thao—; *Italian*: Adianto, Capelvenere, Capillare, Capilvenere—; *Kashmir*: Dumtuli—; *Kumaon*: Mubaraka—; *La Reunion*: Capillaire—; *Lepcha*: Luk-sip, Ruksip—; *Malta*: Maidenhair, Capelvenere, Tursin il Bir—; *Pacific Coast*: Black Maiden's-hair, Lady's hair, Maidenhair, True Maiden's-hair, Venus's-hair Fern—; *Persian*: Barr-i-sija waschan, Kashburat-el-bir, Parsia washan, Pusia wechame, Sirsiapeshane—; *Portuguese*: Avenca, Cabellos de Venus, Capillaria, Herva capillar—; *Roumanian*: Chica-voinicului, Perul fetei, Perul sfantei Marii, Vergura invelita—; *Russian*: Adiant, Krasnyi jenskiy volos—; *Salt Range*: Parasigavashan, Parshavarsha—; *Spanish*: Capilera, Capilera de Mompeller, Culantrillo de pozo—; *Suto*: Pata-lewana, Pata-mawa—; *Teheran*: Kashburat—; *Trans-Indus*: Bisfaif, Kirwatzei—; *Turkish*: Baldirikara—.

6. **Adiantum aethiopicum** Linn. (=*A. emarginatum* Bedd.) is found in North Kanara, and at the higher elevations on the Nilgiris, and the Pulney Hills. It extends to Ceylon, Australia, New Zealand, La Reunion, Madagascar, Cape Colony, Natal, Zambesiland, the Cameroon Mounts up to 7,000 ft., Abyssinia, Spain, and Afghanistan. It also occurs from Texas and California southward to Valparaiso and Montevideo.

An infusion of the leaves is commonly used as an emollient in coughs and diseases of the chest.

At La Reunion the plant is a popular cough medicine, and much used as a sudorific.

In Basutoland a decoction of the caudex is used to promote

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parturition. The natives smoke the leaf for colds in the head and the chest.

Afrikaans: Vrouehaar—; *South Africa*: Large Maidenhair—; *Suto*: Maorumetsoo, Pata-lewana, Pata-mawa—.

7. **Adiantum cuneatum** Langs. and Fisch. is a native of Brazil, very common in cultivation. It runs into many varieties and is difficult to identify.

In Brazil the leaves are a popular cough medicine. The plant is considered a good sudorific.

8. **Adiantum pedatum** Linn. grows all along the Himalayas from Kashmir to Sikkim; scattered, and not plentiful. It extends to China, Manchuria, Japan. It is found abundantly from Unalashka and Canada, southwards to Virginia and California, in wet lands and woods.

The plant is employed in France and North America as a pectoral in chronic pulmonic catarrhs. It is also said to be endowed with astringent and emmenagogue properties.

English: Canadian Maidenhair—; *French*: Capillaire du Canada—; *Pacific Coast*: American Maidenhair, Hair Fern, Rock Fern—; *Spanish*: Capilera del Canada, Culantrillo del Canada—.

9. **Adiantum flabellulatum** Linn. is very common in some parts of India: Nepal, Assam, Khasia, Sylhet. It is found in the Ouvah District of Ceylon, in the Malay Peninsula and the Malay Archipelago, Southern China, Japan.

The rhizome is used as an anthelmintic in the Manipur State and in Annam.

The herb is used in China as a cough medicine.

Annam: Thiet tien thao—; *Chinese*: T'ieh Hsien Ts'ao—.

Aspidium.

The genus consists of 50 species distributed throughout the Tropics.

The following species are used medicinally in Europe—*A. fragile* Sw., *A. roeticum* Linn.—; in China— *A. falcatum* Sw.—; in North America—*A. marginale* Sw., *A. spinulosum* (Mill.) Sw., *A. trifoliolatum* Sw.—; in South Africa—*A. aculeatum* Sw. var. *pungens* Klf., *A. athamanticum* (Hook.) Kuntze—.

Of the numerous species found growing in India, two are therapeutically active:—

I. Indusium orbicular, veins generally anastomosing acutely with free veinlets from their junction; fronds 1-2 ft. long by 6-9 in. broad; sori small copious, scattered ... 1. *A. falcatum.*

II. Indusium often quite absent, peltate orbicular, or reniform, veins copiously anastomosing with free included veinlets; fronds 1-4 ft. long by 1 ft. or more broad; sori on the netted veins, small and scattered in the uncontracted fronds, large and more or less in two rows between the main veins in the contracted ones. 2. *A. polymorphum.*

1. **Aspidium falcatum** Sw. grows in North-Western India and extends from Kashmir and the Punjab to Sikkim and Bhutan, Assam and the Khasia Mountains without being common any-

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where; also in the Nilgiris at the higher elevations. It is found in China, Japan, the Sandwich Islands, Caffraria, Natal, and Madagascar.

The Chinese use the rhizome as an anthelmintic, chiefly for the expulsion of the tapeworm.

Chinese: Kuan Chung—.

2. **Aspidium polymorphum** (Wall.) Bedd. grows in the western forests of the Madras Presidency up to 4,000 ft.; in Northern India from Garhwal to Mishmee and Chittagong; in Burma, Ceylon, the Malay Archipelago, the Philippine Islands, and Fernando Po.

The rhizome is used as an anthelmintic.

Asplenium.

This cosmopolitan genus numbers 540 species.

The following species are used medicinally in Europe—*A. adiantum-nigrum* Linn., *A. ruta-muraria* Linn., *A. trichomanes* Linn.—; in La Reunion—*A. adiantum-nigrum* Linn.—; in South Africa—*A. adiantum-nigrum* Linn., *A. cuneatum* Linn., *A. furcatum* Thunb., *A. monanthemum* Linn., *A. trichomanes* Linn.—; in Brazil—*A. regulare* Sw., *A. sulcatum* Lam.—.

Five therapeutically active species are met with in India:—

I. Fronds pinnate.		
a. Fronds 6-12 in. long, about ⅓ in. broad; sori linear oblong, 3-6 on each side of the midrib	1.	*A. trichomanes.*
b. Fronds 6 in. long to 2 ft. long or more, 4-8 in. broad; sori in long irregular lines reaching nearly to the margin	2.	*A. falcatum.*
II. Fronds bi-quadripinnate.		
a. Fronds 1-2 in. long, about 1 in. broad; sori copious	3.	*A ruta-muraria.*
b. Fronds 6-12 in. long, 4-6 in. broad at the base; veins obscure, oblique; sori copious ...	4.	*A. adiantum-nigrum.*
c. Fronds coriaceous 6-18 in. long, 4-6 in. broad; veins flabellate, deeply channelled; sori linear	5.	*A. furcatum.*

1. **Asplenium trichomanes** Linn. is a common Himalayan fern occurring from Afghanistan to Kumaon at altitudes of 5,000-11,000 ft. It is very common from 5,000 to 9,000 ft. in the Simla Region. It has been found in South India at Kulhatty on the Nilgiris. It occurs in Japan, Java, Australia, Tasmania, and New Zealand, sub-arctic Greenland, Canada and westward to the Rocky Mountains, British Columbia, the United States, Bermuda and southward to Panama, the West Indies Islands, and from Guiana and Venezuela to Bolivia.

This is the common Maidenhair of the British Isles, distributed over the continent of Europe 'throughout its length and breadth, from Iceland and Lapland to the Rock of Gibraltar; throughout the Mediterranean Region; and from the extreme west of Ireland to the extreme east of Europe', Siberia and Persia. It thrives equally well in the Azores and the Macaronesian Isles,

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Algeria, Morocco, Abyssinia, Somaliland, the Ruwenzori Mountain of Central Africa, and the Cape of Good Hope.

Its leaves are sweet, mucilaginous, and expectorant, being therefore highly useful in many pulmonary disorders. A tea brewed from them is one of the common English remedies for a violent cold and for tedious coughs. 'We have the common Maidenhair, which grows on old walls, and which will act as a laxative medicine; whilst idiots are said to have taken it remedially, so as to recover their senses.'

In Basutoland the leaf is smoked for colds in the head and chest.

Catalan: Falsia roja—; *English*: Common Spleenwort, Maidenhair—; *French*: Polytric des officines—; *German*: Rotes Frauenhaar—; *Languedoc*: Fau capillero—; *Spanish*: Politrico—; *Suto*: Lehorometso—; *Tamil*: Mailakkondei—.

2. **Asplenium falcatum** Lam. is found in the western mountains of the Madras Presidency, in Ceylon, the Malay Peninsula, Australia, Polynesia, South Africa and its islands.

In Goa and Malabar the plant is used as an alterative in cases of prolonged malarial fever.

Bombay: Pana—; *Goa*: Pandan—; *Malayalam*: Nelapannamaravara—.

3. **Asplenium ruta-muraria** Linn. is common in Afghanistan and extends through Kashmir and Baltistan as far as West Nepal, with a gap between West Kashmir and Kumaon. It is found in Turkish Armenia, the Ural Mountains to Caucasus, Turkestan, Tibet, and Siberia, Algiers, the Cape Colony, and many parts of the United States. It is distributed all over Europe: from Arctic Regions, to Spain and Portugal, Italy, the Mediterranean Isles, Greece, and Turkey.

This small herb is still used to some extent in England as a deobstruent and expectorant.

'The Wall Rue is likewise good for them that have a cough, or are shortwinded, or be troubled with stitches in the sides. It stayeth the falling or shedding of the hair, and causeth them to grow thick, fair, and well coloured. Also it helpeth ruptures in children.'

The Fern has been called Tentwort, from its use as a specific or sovereign remedy for the cure of rickets, a disease once known as 'the taint'.

In China it is considered a valuable medicine for the treatment of pulmonary diseases.

Catalan: Falsia blanca, Ruda de rata—; *Chinese*: Koui Ts'ang—; *English*: Tentwort, Wall Rue—; *French*: Capillaire blanc, Doradille des murailles, Rue des murailles, Sauve-vie—; *German*: Weinkraeutel—; *Spanish*: Calantrillo blanco mayor—.

4. **Asplenium adiantum-nigrum** Linn. is found in Afghanistan and Kashmir, at 5,000-8,000 ft., extending to Dalhousie and Chamba. It occurs in Java, the Sandwich Islands, Azores, Canaries, Madeira, Cape Verde Isles, St. Helena, Mascarene Isles, Cameroon Mounts, Algeria, Abyssinia, Natal, the Cape Colony. It is distributed all over Europe—the United Kingdom, Norway and

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Denmark, through Holland, Belgium, Germany, France, Switzerland, Austria, Spain, Portugal, Mediterranean Region, Greece, Turkey— and Northern Asia—Armenia, Syria, Arabia, Persia, and Siberia—.

Yunanists describe the plant as bitter, diuretic, laxative, lessening inflammations and abating hiccough, producing sterility in women. They consider it useful in the treatment of ophthalmia and diseases of the spleen.

A decoction or syrup of the fronds is used as an expectorant, pectoral, and emmenagogue in Europe.

The rhizome is used as an anthelmintic in Basutoland.

Catalan: Falsia negra—; *English*: Black Spleenwort—; *French*: Capillaire noir—; *La Reunion*: Capillaire noir—; *Spanish*: Capilera negra—; *Suto*: Lehorometso—.

5. **Asplenium furcatum** Thunb. is common on the higher western mountains of South India, and in Ceylon at 5,000-7,000 ft. It is found in Tropical America, the Polynesian Islands, Australia, Cape Colony, Abyssinia, the Mascarene Islands, and Canaries.

The rhizome is used as an anthelmintic in Basutoland.

Suto: Lehorometso—.

Athyrium.

This cosmopolitan genus numbers 120 species.

Athyrium filix-foemina Roth. is found all along the Himalayas from Afghanistan to Sikkim, at 6,000-13,000 ft., and extends to Sind and the Bombay Presidency. It occurs throughout Europe from Lapland, Russia and Scandinavia to Spain, Portugal, Italy, Greece, Crete, and the Caucasus. From Japan and Kamschatka it crosses to Sitka and Labrador, Canada, British Columbia, the United States, Cuba, Caraccas and Venezuela. It is also met with in the Azores and Macaronesian Isles, Algeria, the mountains of Cameroon, Abyssinia, and Natal.

The rhizome is supposed to possess vermifugal properties similar to those of the male fern for which it is used as an occasional substitute.

In Germany the rhizomes of this fern are frequently found mixed with those of the true male fern.

Catalan: Falguera femella—; *Spanish*: Helecho hembra—.

Blechnum.

This genus consists of about 60 species, mostly tropical American.

Blechnum orientale Linn. is found throughout India, Ceylon and the Malay Peninsula, up to 6,000 ft. in the south, and 4,000 ft. on the Himalayas. It extends to the Malay Islands, China, Polynesia, and Australia.

The rhizome is used in China as an anthelmintic.

Cantonese: Kun chung—; *Chinese*: Kuan Chung—; *Malaya*: Koon choong—,

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Botrychium.

A cosmopolitan genus consisting of about 40 species, three of which are credited with medicinal properties.

I. Stipes erect, smooth, cylindrical, hollow, succulent; vernation plicate or folded straight; the fertile branch clasped by the sterile before unfolding, pinnate or bipinnate	1. *B. lunaria.*
II. Stipe 1-2 in. long; petiole of the sterile segment 2-8 in. long, the latter 3-6 in. each way; fertile peduncle up to 18 in. long, generally considerably over-topping the sterile segment	2. *B. ternatum.*
III. Stipes 3-8 in. long; sterile portion not prolonged beyond the fertile spike 4-12 in. each way; fertile branch of the rachis springing from the base of the sterile portion or from the middle of it	3. *B. virginianum.*

1. **Botrychium lunaria** Sw. is profuse in Afghanistan at 9,000-10,000 ft., common from Kashmir to Sikkim ascending up to 13,000 ft., and extending to the Karakoram Range in Western Thibet. It is found in South Australia, Tasmania, New Zealand, Japan, Kamschatka, Greenland, Newfoundland, Canada, British Columbia, New York, Lake Superior, Colorado, Patagonia, Iceland, Arctic Russia, Livonia, Lithuania and Caucasia, the British Isles, Spain, Italy, Switzerland and the Mediterranean Isles.

The plant is considered a good vulnerary. It is also much used in dysentery.

'This herb is cold and drying, and is available for wounds both outward and inward. The leaves boiled in red wine, and drank, stay immoderate courses and the whites. It stays bleeding, vomiting, and other fluxes. It helps all blows and bruises, and consolidates all fractures and dislocations. It is good for ruptures, and is put into oils and balsams to heal fresh and green wounds.'

English: Moonwort—; *French*: Herbe aux serpents, Petite lunaire—; *German*: Walpurgiskraut—; *Italian*: Vindicta—.

2. **Botrychium ternatum** (Thunb.) Sw. is found in the Himalayas from the Punjab to Nepal and Sikkim, and has been reported from Mount Abu. It extends to Tasmania and New Zealand, Japan, Siberia and Kamschatka, Nootka and Hudson's Bay Territory, Canada, New England, westwards to California, Washington, and southwards to Florida, hence to New Grenada. In Europe it occurs in Lapland, Hungary, and the Pyrenees.

The plant is used as a vulnerary in China; and the root is prescribed in dysentery.

Chinese: Yin Ti Chueh—; *Indo-China*: Am dia guyet—.

3. **Botrychium virginianum** Sw. occurs in the Himalayas from the Punjab to Sikkim. It is found from Norway to Austria, in Ecuador and Brazil, from New Brunswick to Florida, and westwards to Arizona and the Pacific Coast—British Columbia southwards to Oregon.

The fleshy root is used by American Indians in application to cuts and bruises.

Pacific Coast: Grape Fern, Moonwort, Rattlesnake Fern—.

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CERATOPTERIS.

The only species known, **C. thalictroides** Brong., is found throughout India, Ceylon, and the Malay Peninsula up to 3,000 ft. elevation; common in tanks, ditches, and swampy places; or even dry ground during the rains. It extends to the Great Coco Island, the Nicobar Islands, Java, the Philippine Islands, Japan, China, Hongkong, South Florida, Mexico, and the West Indies southwards to Brazil. It also occurs in Arabia Felix and South-Eastern Arabia; and is found in Tropical West Africa, Angola, and Madagascar.

The plant is used in China as a tonic and styptic.

Chinese: Shui Chueh—.

CHEILANTHES.

The genus consists of 120 species, inhabiting tropical and temperate regions.

C. hirta Swartz. is used medicinally in South Africa.

Cheilanthes tenuifolia Sw. is common in the Madras Presidency, in the plains and on low hills up 4,000 ft. It occurs in Bengal, in the plains of Assam, Chittagong, Dacca, Chota Nagpore, in Khasia up to 5,000 ft., Sikkim, the Malay Peninsula, and the Malay Islands. It extends to China, Australia, New Zealand, Polynesia, and Uruguay.

The Santals prescribe a preparation from the roots for sickness attributed to witchcraft or the evil eye.

Santali: Dodhari, Nanha—; *Tasmania*: Parsley Fern—.

CIBOTIUM.

This genus contains 10 species, inhabiting tropical America, Polynesia, and Asia.

Cibotium barometz Link. (=*C. glaucum* Bedd.) is found in Mishmi, Assam, and Tavoy, extending to the Malay Islands and South China.

The drug consists of the lower part of the caudex, reddish brown in colour, in longitudinal slices, covered on the outside with golden brown moniliform hairs suggesting the fur of an animal. The hairy rhizome thus sometimes resembles a lamb, hence the specific name *barometz*, Russian for lamb. It is the Agnus Scythicus, or Tartarian or Vegetable Lamb, a drug of great repute alluded to in medical works of the sixteenth and seventeenth centuries.

The root is employed in China as a tonic, and is said to exercise a special action on the genito-urinary organs. It is also given for lumbago.

In Annam the stems are considered tonic and styptic. The rhizome, like other fern roots, is used as a vermifuge.

The golden brown hair from the base of the fronds is used in Malaya, Java and Sumatra for stanching wounds. It has the power of causing rapid coagulation of blood, and, when properly used, of mechanically arresting hemorrhages from capillaries. It

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has been much used in the physiological laboratories of Europe and America, and was employed in human medicine during the Middle Ages.

Annam: Bach chi, Cau quyet, Cau thank, Cau tich, Cay cu lan, Cay cu li, Cay cu lon, Cay ku lien, Cay tien phuong vi, Cuong lu, Cu seoga, Kim Mao, Phu can—; *Cantonese*: Kau Tsek—; *Chinese*: Kou Chi, Toei Choun—; *French*: Agneau de Scythie, Agneau de Tartarie, Chien roux, Poil de singe—, *Malaya*: Kow chiak—.

Cystopteris.

This genus consists of 5 species distributed through the temperate regions of the world.

Cystopteris fragilis Bern. is found in Afghanistan and on the Himalayas from Kashmir to Sikkim ascending to 10,000-15,000 ft. It extends to Australasia, New Zealand, the Sandwich Isles, the Arctic and temperate regions of North America, California, Mexico, and through the whole length of the Andean Chain. It is found in the West Indies, and everywhere in Europe from Iceland and Novaya Zemlya and Spitzbergen in the Arctic Regions to Spain, Sicily, Cyprus and the Caucasus. It also occurs in the Lebanon, Persia, Kurdistan, Siberia, Manchuria, Kamschatka, Tibet, and North China. It is distributed to Madeira, Fernando Po, Abyssinia, and South Africa.

The Sutos of Basutoland use a decoction of the rhizome as an anthelmintic enema.

Suto: Lehorometso—.

Drymoglossum.

This tropical genus numbers about 10 species.

Drymoglossum carnosum Hook. is common in Nepal, Sikkim, and Bhutan at 2,000-5,000 ft. elevation. It extends to China and Japan.

The fronds are pectoral, diuretic, and astringent. They are used in China in urinary calculus and rheumatism.

Chinese: Lo Yen Ts'ao—.

Drynaria.

This genus consists of 20 species, inhabitants of the Palaeotropics.

Drynaria quercifolia J. Sm. (=*Polypodium quercifolium* Linn.) is found throughout India, in the plains or very low down on the mountains, on trees or rocks.

The Ayurvedists describe the rhizome as bitter, tonic, astringent to the bowels, and useful in the treatment of typhoid fever.

The plant is commonly used in the treatment of phthisis, hectic fever, dyspepsia, and cough.

Ilocano: Capcapa—; *Malayalam*: Pannakilhannumaravala—; *Marathi*: Ashvakatri, Basingh, Wandurbashing—; *Pampangan*: Gona, Tibatib—; *Sanskrit*: Ashvakatri—; *Tagalog*: Pacpaclauin, Paipaiamo—; *Visayan*: Cabcab, Cabcaban, Cabcabun—.

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Dryopteris.

This genus numbers 250 species found distributed throughout the northern temperate regions.

It is probable that all of the species of this genus possess more or less anthelmintic properties. The following are commonly used in China—*D. sophoroides* O. Kuntze—; in Japan—*D. crassirhizoma* Nakai—; in North America—*D. marginalis* (Linn.) Asa Gray, *D. rigida* Underw.—; in South Africa—*D. athamantica* (Ktze) O. Kuntze, *D. inaequalis* O. Kuntze.— But by far the most famous species is *D. filix mas* (Linn.) Schott, one of the oldest drugs known, and one which is still retained by all pharmacopoeias.

Dryopteris filix-mas (Linn.) Schott.—Male Fern—.

The synonyms for the male fern are extraordinarily numerous, and the following are among the better known or more commonly occurring:—*Aspidium filix-mas* of many authors, *A. wildeanum* Goeppert, *Dryopteris filix-mas* (Linn.) Schott, *Lastrea filix-mas* Presl., *Lophodium filix-mas* Newm., *Nephrodium filix-mas* Rich., *Polypodium filix-mas* Linn., *P. nemorale* Salisb., *Polystichum abbreviatum* DC.?, *P. durum et induratum* Schur., *P. filix-mas* Roth., *Tectarea filix-mas* Cavan. Since the term *Dryopteris* was first used by Amman in 1739, and applied in 1763 by Adamson, as the name of the genus to which the term *Aspidium* was applied in 1800 by Swartz, the use of the generic term *Dryopteris* would seem to be necessitated by the laws of botanic nomenclature.

The Male Fern is of very wide distribution, occurring in America from Greenland, westwards and southwards, along the Rocky Mountains and Andes to Peru. It is found throughout Europe, in North Asia, eastwards to China and Japan. It is also distributed to Abyssinia, the Azores and Macaronesia. In the Indian region it is generally confined to considerable elevations—6,500-11,000 ft.—on the mountains, from the Lowari Pass to Kashmir, Chamba, Kullu, the Simla Region, and Garhwal.

The male fern has been recommended as a local application in eczema and acne. It is, however, as a vermifuge that the drug is better, if not exclusively, known. It is as such that it is mentioned in the works of Dioscorides, Theophrastus, Galen and Pliny, and by some of the earlier modern writers. It is now used in medicine almost solely for the purpose of getting rid of various intestinal parasites, especially the *tapeworm*. As to its value in other forms of helminthiasis there is difference of opinion. Some authors report as many as 75 per cent of cures in cases of *hookworm* infection, but other workers state that the drug has been found absolutely without value in this infection. There has been a great deal of uncertainty as to the efficacy of male fern, especially in tropical climates, and many observers have found it to be not only inefficient and unreliable, but a toxic and a dangerous remedy.

A large amount of chemical work has been done and a number of substances have been isolated from the drug, but the chemical nature of the different constituents is still not clear. This is not

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surprising as these compounds are unstable bodies and undergo chemical changes in the dry rhizome as well as in the preparations of the oleoresin and the ethereal extract. That is one of the reasons why such widely controversial results have been obtained regarding their physiological activity.

No doubt that the rhizomes of other species of fern are frequently substituted for the 'official', and that in the dried state it is difficult to distinguish them; but which is the official form? A look at herbariums will convince any one that a heterogeneous mass of plants is named *filix-mas*. A talk with the leading pteridologists of the day will further bring home the astounding information that experts are not agreed that even the European forms of *filix-mas* all belong to the same species!

Catalan: Falguera mascle—; *Danish*: Bregne—; *Dutch*: Varen Kruid—; *English*: Male Fern, Shield Fern—; *French*: Fougère mâle—; *German*: Farnkraut, Farnwurzel, Wurmfarn—; *Hungarian*: Erdei pajzsikapapany—; *Italian*: Felce maschio—; *Naples*: Fielici, Filici—; *Norwegian*: Bregne—; *Pacific Coast*: Aspidium, Basket Fern, Bear's Paw, Knotty Brake, Male Fern, Male Shield Fern, Sweet Brake—; *Piedmont*: Fales, Feles, Fleis—; *Portuguese*: Dentebrura, Feto macho—; *Potenza*: Fivece—; *Puglia*: Fidvitti—; *Reggio*: Felsa mas'c—; *Sardinia*: Filighee mas'cia, Filixi maschin—; *Spanish*: Helecho macho—; *Swedish*: Ormbunk, Traejon—; *Treviso*: Felese mas'cio—; *Turkish*: Serhasi müzekker—.

Gleichenia.

This genus consists of 25 species inhabiting tropical and subtropical regions.

Gleichenia dichotoma Willd. is found in the mountains of Southern India and Ceylon, up to 6,000 ft., Kumaon, Nepal, Sikkim, and Bhutan, Khasia Hills up to 5,000 ft., Sylhet, Pachmarhi, Tenasserim, South Andamans, the Malay Peninsula, Sumatra, East Timor, Tropical Australia, Japan, America—.

In Annam the rhizome is used as an anthelmintic. In Madagascar the fronds are given as a cure for asthma.

Annam: Hac cot mang, Hac cot phuong, Tieu ly bach—; *Madagascar*: Ampangantsirika—.

Helminthostachys.

The only species, **H. zeylanica** Linn., is found in South India, in the western forests in swampy places up to 3,000 ft. elevation. It also occurs in Ceylon, about Colombo and other parts of the western and southern provinces, in the plains of Bengal to Assam and Cachar. It extends to the Malay Peninsula, the Malay Islands, the Philippine Islands, Tropical Australia, and New Caledonia.

It is regarded in the Moluccas as a mild aperient.

Annam: Quan trong—; *French*: Osmonde de Ceylan—.

Hemidictyum.

This genus consists of 2 species found mostly in temperate regions.

Hemidictyum ceterach Linn. (=*Asplenium ceterach* Linn. =*Ceterach officinarum* Willd.) occurs on the rocks overhanging the

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Karriah River in the Kurram Valley, but is rare there. It is very common in Kashmir, Punjab, and Garhwal ascending up to 9,000 ft. It is found in many parts of Germany, in Switzerland, the Tyrol, Hungary, Dalmatia, the Caucasus, Belgium, France, Spain, Italy, Greece. In Britain it is to be seen in all or nearly all the southern, northern, and western counties; 'in Somersetshire and Devonshire it is especially abundant, in Scotland it is much less frequent' chiefly in the west and south-west; it is frequent in Ireland, though local. It extends to Palestine and Persia, the Canaries, Madeira and Cape Verde Islands, Morocco, Algiers, Abyssinia, and the Cape of Good Hope.

'No herbe maie be compared therewith for his singular virtue to help the sicknesse or grief of the spleen', says one of the oldest Herbals. 'It is generally used against infirmities of the spleen, helps the strangury, and wastes the stone in the bladder, and is useful against the jaundice and the hiccough', states Culpeper.

The plant is considered diuretic and astringent. It is still occasionally used in France for diseases of the urinary tract. The rhizome is used medicinally in several parts of Europe for enlargement of the spleen, incontinence of urine, calculus, jaundice, and malaria.

Dioscorides mentions the use of a decoction of the plant in vinegar for enlargement of the spleen, and also the local application of a plaster made of the leaves steeped in wine. Women were not allowed to use it as it was supposed to cause sterility. Pliny ordered 'it should not be given to women, because it bringeth barrenness'.

The rusty-coloured scales under the blades were at one time used as a cure for gonorrhoea.

Catalan: Dauradella, Herba daurada—; *English*: Finger Fern, Miltwaste, Rusty Back, Scaly Fern, Spleenwort, Stone Fern—; *French*: Cétérach officinal, Dauradille, Doradille, Doradille cétérach, Doradille d'Espagne, Herbe dorée, Scolopendre vraie—; *German*: Milzfarn—; *Portuguese*: Douradinha, Escolopendra—; *Spanish*: Capilera dorada, Ceterach, Doradilla—.

Lygodium.

This genus numbers 22 species to be found in tropical and subtropical regions.

Two of the species are credited with medicinal properties:—

Pinnules 8-12 in. long, 6-12 in. broad ...	...	1. *L. flexuosum.*
Pinnules smaller, 4-8 in. long, about as broad	...	2. *L. japonicum.*

1. **Lygodium flexuosum** Sw. (=*L. pinnatifidum* Sw.) is very common in the Dehra Dun, Kumaun, Sajahanpur, Gorakhpur; it is abundant throughout the plain in Bengal up to 5,000 ft., and also on both sides of the Madras Presidency up to about 4,000 ft. It extends to Ceylon, the Malay Peninsula, the Philippine Islands, North Australia, Angola, and the Guinea Coast.

The plant is commonly used as an expectorant.

In Tirhut the fresh root is boiled with mustard oil and used externally in rheumatism, sprains, scabies, ulcers, eczema, and cut wounds. It is particularly useful as a local application to carbuncles.

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In Indo-China an infusion of the plant is used in blennorrhagia; it is said to be a good lactagogue.

Indo-China: Bong bong, Duong vong, Thach vi day—; *Malayalam*: Vallipanna—; *Tirhut*: Kalazha—.

2. **Lygodium japonicum** Sw. occurs abundantly in North India from Kashmir to Sikkim and Bhutan from 2,000-7,000 ft. elevation. It is rare in the western mountains of South India. It is distributed to Ceylon, Java, the Philippine Islands, China, Japan, and North Australia.

The plant is used as an expectorant in China. It is also used in haematuria and blennorrhagia.

Chinese: Hai Chin Sha—; *Indo-China*: Hai kim sa—.

Ophioglossum.

This genus consists of 30 species inhabiting tropical and temperate regions.

Ophioglossum vulgatum Linn. occurs in North India from Chamba State to Sikkim ascending up to 9,000 ft. on Mount Hattu and 2,000 ft. below Darjeeling; it is also found in Chota Nagpore on the Parasnath Mount at an altitude of 2,500 ft. It extends to Japan, the Sandwich Islands, Australia, and New Zealand. It is met with in North America, from Quebec and Ontario southwards to Florida and California, Kentucky, Tenessee, Texas and Arizona to Alaska. In Europe it inhabits Lapland, the British Isles and almost all other countries to Caucasia. In Africa it occurs in the Azores, Abyssinia, the Guinea Coast, Angola, St. Helena, Zambesiland, Cape Colony, and the Mascarene Isles.

A preparation from this plant, known as the 'green oil of charity', is in request in England as a vulnerary and remedy for wounds.

The plant is held in France and Spain as a vulnerary of great repute.

The plant yields a mucilaginous and astringent decoction which is used in angina in La Reunion. The fronds are considered tonic and styptic, and used in contusions, wounds, and haemorrhages.

A warm decoction of the rhizome is used by the Sutos as a lotion for boils.

Catalan: Llansa de Cristo, Llengua de serp—; *English*: Adder's Tongue, Christ's Spear—; *French*: Herbe à daucune, Herbe sans couture, Lance de Christ, Langue de serpent, Luciole, Ophioglosse, Ophioglosse commune, Petite serpentaire, Serpentine—; *Hausa*: Mashinzomo—; *La Reunion*: Herbe un coeur, Herbe paille-en-queue, Langue de serpent—; *Spanish*: Lengua de serpiente—; *Suto*: Mmadiyo, Tsebe-ngwe, Tseyananyane—.

Osmunda.

This genus consists of 10 species distributed throughout the temperate and tropical countries of the world.

Fronds 2-4 ft. long, 1 ft. or more broad, bipinnate ...	1.	*O. regalis.*
Fronds 1-2 ft. long, 8-12 in. broad, simply pinnate ...	2.	*O. claytoniana.*

1. **Osmunda regalis** Linn. is common on the western mountains of South India at the higher elevations; it is found in the

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Himalayas from the Chamba State to Sikkim and Bhutan, but has become very rare in the Simla region; it is common, or at least frequent, in the Khasia District up to 4,000-6,000 ft., in the Central Provinces, and in the Bombay Presidency. It extends to South and West China, Hongkong, Japan, Canada and the Saskatchewan to Brazil. In Europe it is distributed over the British Isles, Sweden and Russia to Spain, Italy, Turkey, and to Siberia. It is met with in the Azores, Algeria, Tunis, Abyssinia, Angola, Central Africa, Nyassaland, Zambesiland, Natal, Cape Colony, and the Mascarene Isles.

The plant is a well known tonic and styptic, and is still very much employed all over Europe. It is used for rickets in England and in France.

The white centre of the root, boiled in some kind of liquor, was supposed good for persons wounded, dry-beaten, and bruised, or that have fallen from some high place.

The root or rhizome stamped in water or gin till 'the liquor becometh a stiff mucilage, has cured many deplorable pains of the back, that have confined the distracted sufferers close to bed for several weeks.' This mucilage was to be rubbed over the vertebrae of the back each night and morning for five or six days together. Also for rickets, 'take of the powdered roots with the whitest sugar, and sprinkle some thereof on the child's pap, and on all his liquid foods. It maketh a noble remedy without any other medicine.'

The tender sprigs of the plant at their first coming are 'good to be put into balmes, oyles, and healing plasters'.

This is much more effectual than the other ferns, both for inward and outward uses, says Culpeper. It is accounted singularly good in wounds, bruises, or the like; the decoction to be drunk, or boiled into an ointment of oil, as a balsam or balm, and so it is singularly good against bruises, and bones broken, or out of joint, and gives much ease to the colic and splenetic diseases; as also ruptures and burstings.

In Guinea an extract is prepared and is used externally for rheumatism and internally for intestinal griping.

English: Flowering Fern, Osmond Royal, Osmund-the-Waterman, Royal Fern, Royal Flowering Fern, Water Fern—; *French*: Fougère aquatique, Fougère fleurie, Fougère royale, Osmonde, Osmonde fleurie, Osmonde royale—; *Fulah*: Kolo kouli—; *German*: Koenigsfarn, Traubenfarn—; *Hova*: Ampangafenakoho—; *Indo-China*: Vi—; *Languedoc*: Fougeiroux—; *Spanish*: Helecho acuatico, Helecho florido, Helecho real—.

2. **Osmunda claytoniana** Linn. is found growing in the Himalayas from Kashmir to Bhutan at 6,000-10,000 ft. elevation, in the Khasia Mountains up to 4,500-6,000 ft. It also occurs in Canada, Newfoundland, and throughout the United States.

The rhizomes are used as an adulterant for Male Fern in the American market.

Pellaea.

This genus consists of 40 species found in subtropical regions. *P. calomelanos* Link., *P. consobrina* Hook., *P. hastata* (Thunb.) Prantl., *P. involuta* Bkr. are used medicinally in South Africa.

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Pellaea calomelanos Link. is found in the Sirmur State, Dehra Dun, Garhwal, Kumaon, ascending up to 5,000 ft. It extends to Angola, Abyssinia, Somaliland, the Ruenzori Mounts, Zambesiland, Mashonaland, Natal, Cape Colony, and La Reunion.

The Sutos use the rhizome as an anthelmintic, and smoke the leaf for colds in the head and chest.

Suto: Lehorometso, Pata-lewana, Pata-mawa—.

Pleopeltis.

This genus numbers 35 species distributed throughout tropical and subtropical regions.

Pleopeltis lanceolata Linn. is found on the Nilgiris and higher mountains on the west side of the Madras Presidency, and extends to Assam and Ceylon. It occurs in Tropical America and the West Indies, South Africa and its islands, St. Helena, and the Sandwich Islands.

In Mexico a tea made from the fronds is taken to cure the itch.

Pteris.

A cosmopolitan genus numbering 160 species.

P. aquilina Linn. is used medicinally in Europe, China, La Reunion—; *P. multifida* Poir. in China—; *P. leptophylla* Sw., *P. palmata* W., *P. pedata* Sw. in Brazil—; *P. buchanani* Bkr. in Basutoland—.

Pteris aquilina Linn. is very common in the Himalayas, common in the Khasia Hills at 2,000-8,000 ft. It extends to the Deccan, the Madras Presidency, Ceylon, Tenasserim, the Malay Peninsula, and eastwards to Australia and New Zealand. It is universal in Europe, except in the extreme north, and never an Alpine plant; its range in the British Isles is said to agree closely with that of corn cultivation, and in the Scottish Highlands it never rises above 2,000 ft. It is found in the Cameroon Mountains and in Abyssinia. In general it may be said to thrive all round the world, both within the Tropics, and in the North and South Temperate Zones.

The rhizome is reputed astringent and anthelmintic.

A decoction of the rhizomes and fronds has been given in chronic disorders arising from obstructions of the viscera and spleen.

'For thigh aches smoke the legs thoroughly with Fern braken.'

'The roots being bruised and boiled in mead, or honeyed water, and drunk, kills both the broad and long worms in the body, and abates the swelling and hardness of the spleen. The green leaves eaten, purge the belly, and expel choleric and waterish humours that trouble the stomach. They are dangerous for women with child to meddle with by reason they cause abortions. The roots bruised and boiled in oil, or hog's grease, make a very profitable ointment to heal wounds, or pricks gotten in the flesh. The powder of them used in foul ulcers, dries up their malignant moisture, and causes their speedier healing.'

Cantonese: K'uet—; *Catalan*: Falguera femella—; *Chinese*: Chueh—; *Dutch*: Groote varen, Varen—; *English*: Bracken, Brakes, Female Fern—;

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French: Filipode, Fougère à l'aigle, Fougère commune, Fougère femelle, Fougère impériale, Fruchière, Ptéride—; *German*: Adlerfarn, Farmkrautweiblein, Fluegelfarn, Jesuschristuswurzel—; *Indo-China*: Guyet—; *Ireland*: Fern of God—; *Languedoc*: Feuvé—; *Malaya*: Keat—; *Malayalam*: Tavi—; *Malta*: Bracken, Eagle Fern, Felce aquilina, Felce capannaja, Felicilla, Felicita—; *New Caledonia*: M'Baoue—; *Portuguese*: Feto—; *Punjab*: Dio, Kakei, Kakhash, Lungar—; *Roumanian*: Navalnic pajuriu, Spinarea lupului—; *Russian*: Paporotnik—; *Saora*: Manmarda—; *Spanish*: Helecho hembra—; *Tamil*: Parnai—.

Stenoloma.

S. chinensis Bedd. (=*Davallia tenuifolia* Hook.) is found in the western mountains of the Madras Presidency at 3,000-6,000 ft.; in the Himalayas from the Simla region to Bhutan at 1,000-7,000 ft., plentiful eastwards; it is common in the Khasia Hills at 1,000-3,000 ft. Central Provinces, Pachmarhi, Ceylon, the Malay Peninsula, Japan. It extends to Polynesia and the Mascarene Islands, being common everywhere.

It is administered internally for chronic enteritis in Mauritius.

Chinese: Wu Chiu—; *English*: Parsley Fern—; *Mauritius*: Petite fougère—.

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EARTH-EATING AND SALT-LICKING IN INDIA.

BY

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ANALYSES XXXVI-XXXIX

XXXVI. *Soil from Salt-Lick*

Serial No. 49.

Locality—Sironcha Range, Chanda District, Central Provinces.

Collected and sent by—The Deputy Conservator of Forests, South Chanda

Light buff lumps crumbling easily to powder. Powder gritty.

Minerals	... 4·63 per cent.
Clay	... 20·14 ,,
Sand	.. 73·99 ,,
Organic debris	... 0·51 ,,
Moisture	... 0·11 ,,
Fine Earth (20 mesh sieve) ...	... 95·325 ,,
Insoluble in nitric acid ...	... 69·931 ,,
Soda (Na_2O) ...	... 0·721 ,,
Potash (K_2O) ...	... 1·277 ,,
Magnesia (MgO) ...	... 0·385 ,,
Lime (CaO)	... 0·470 ,,
Alumina (Al_2O_3) ...	... 4·774 ,,
Silica (SiO_2) soluble ...	... 12·635 ,,
Phosphorus (P_2O_5) ...	... 1·434 ,,
Ferric oxide (Fe_2O_3) ...	... 1·584 ,,
Moisture and organic matter	... 2·095 ,,

Remarks.—the same as for Salt-lick No. 48.

XXXVII *Soil from Salt-Lick*

Serial No. 234

Locality—Near Latimu River, at an altitude of 4,000 feet, in the Mpika District, Northern Rhodesia

Collected and sent by—Capt. C.R.S. Pitman, Broken Hill, Northern Rhodesia.

Greyish powder and pellets, some of these flinty, with quartz and marble. Powder gritty; the finer portions soft.

Minerals	... 12·86 per cent
Clay	... 30·12 ,,
Sand	... 50·12 ,,
Organic debris	... 0·67 ,,
Moisture	... 1·87 ,,
Fine Earth (20 mesh sieve) ...	... 85·075 ,,
Insoluble in nitric acid ...	... 47·344 ,,
Potash (K_2O)	... 1·628 ,,
Magnesia (MgO)	... 0·044 ,,
Lime (CaO)	... 1·594 ,,
Alumina (Al_2O_3) ...	... 2·218 ,,
Carbon dioxide (CO_2) ...	... 0·860 ,,
Silica (SiO_2) soluble ...	... 25·838 ,,

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Phosphorus (P_2O_5)	...	...	0·861 ,,
Ferric oxide (Fe_2O_3)	...	...	0·429 ,,
Moisture and organic matter		...	4·480 ,,

Remarks.—1. The soil contains traces of humus, and 2 per cent water-soluble organic and inorganic matter.

2. The lick is frequented by elephants, black rhinoceroses, buffaloes wart hogs, and various antelopes.

XXXVIII. *Soil from Salt-Lick*

Serial No. 23.

Locality—Sonrai Beat, Marora Range, Jhansi Forest Division.

Collected and sent by—The Divisional Forest Officer, Jhansi.

Friable cement-grey lumps with rootlets. Powder gritty, the finer parts soapy.

Minerals	...	...	2·03 per cent
Clay	...	...	2·34 ,,
Sand	...	...	88·14 ,,
Organic debris	...	...	3·10 ,,
Humus	...	...	0·34 ,,
Moisture	...	...	2·89 ,,
Fine Earth (20 mesh sieve)		...	94·235 ,,
Insoluble in nitric acid		...	62·425 ,,
Soda (Na_2O)	...	...	1·824 ,,
Potash (K_2O)	...	...	3·671 ,,
Magnesia (MgO)		...	0·396 ,,
Lime (CaO)	...	...	0·621 ,,
Alumina (Al_2O_3)		...	1·960 ,,
Silica (SiO_2) soluble		...	16.173 ,,
Phosphorus (P_2O_5)		...	0·381 ,,
Manganese (Mn)		...	0·063 ,,
Ferric oxide (Fe_2O_3)		...	3·119 ,,
Moisture and organic matter		...	3·941 ,,

XXXIX. *Common Earth*

Serial No 24.

Locality—Sonrai Beat, Marora Range, Jhansi Forest Division.

Collected and sent by—The Divisional Forest Officer, Jhansi.

Buffy friable lumps. Powder gritty; finer parts soft.

Minerals	...	...	9·46 per cent
Clay	...	...	2·45 ,,
Sand	...	...	80·63 ,,
Organic debris	...	...	3·56 ,,
Humus	...	...	0·40 ,,
Moisture	...	...	1·59 ,,
Fine Earth (20 mesh sieve)		...	88·563 ,,
Insolube in nitric acid		...	63·484 ,,
Soda, (Na_2O)	...	...	0·003 ,,
Potash (K_2O)	...	...	2·760 ,,
Magnesia (MgO)	...	...	0·413 ,,
Lime (CaO)	...	...	0·457 ,,
Alumina Al_2O_3)	...	...	1·004 ,,
Silica (SiO_2) soluble		...	10·267 ,,
Phosphorus (P_2O_5)		...	1·610 ,,
Manganese (Mn)	...	...	0·147 ,,
Ferric oxide (Fe_2O_3)		...	3·972 ,,
Moisture and organic matter		...	4·389 ,,

Remarks: 1. The soil contains 0·003 per cent of sodium chloride, 0·273 percent of water soluble inorganic matter consisting chiefly of colloidal silica and traces of soluble sulphates, and 0·105 per cent of water soluble organic matter.

2. The earth was collected from a plot adjoining Salt-Lick No. 23.

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Procedure Adopted in the Analysis.

By way of answer and request.—The study of salt-licks was started in the *Journal of the Bombay Natural History Society* six years ago in the number of the 31st May 1929. From various quarters at one time or another the question has been asked: 'Why is this investigation into the composition of salt-licks not carried on more energetically?' The answer runs as follows: 'This investigation is from beginning to end a work of chemical analysis, which of its very nature is long and slow, especially when it has all to be done by a couple of workers who can only devote their spare time to the task.'

It is true that certain students interested in this enquiry sent us their analytical results of various salt-licks for comparison with our own, thus showing an interest which was both gratifying and encouraging. It must, however, be remarked that the analytical results which have been forwarded did not prove very helpful. It is well known, indeed, that analyses of the same material made by different analysts sometimes differ materially, even when the analyses are made by skilled analysts of high repute. These differences are commonly due to the use of different analytical methods or to differences of detail in operating the same method.

Thus far the answer to the question why the investigation of salt-licks takes so long.

At the same time, it is a thousand pities that the work is proceeding so slowly; and we do earnestly invite the co-operation of all those who are interested in the subject. In other words we ask for the analytical results of other research workers. This is the request we venture to make.

But, lest those who wish to comply with this request should work in vain and thus waste time and energy, it has been decided on to give a full description of our way of proceeding in the analysis of salt-licks and common earths. It need not be added that any research work carried on according to this method will prove very helpful, and will be gratefully received and duly acknowledged in the *Journal of the Bombay Natural History Society*—for we believe in the good old principle: *cuique suum*.

By way of illustration, results and calculations are given *in extenso* for a sample of common earth from the Sonrai Forest, Marora Range, Jhansi.—Serial No. 24.—Analysis XXXIX.

A. *Preparation of Fine Earth for analysis; and estimation of moisture, minerals, and fine earth.*

About 100 grams of the air-dried earth are weighed out in a beaker, and water is added so as just to cover the earth. The beaker is covered and allowed to stand for 12 hours. At the end of 12 hours, the clayish concretions are entirely broken up into grains, and it is possible by levigation and sieving to separate all the fine earth from minerals.

The suspension and earth contained in the beaker are poured on a brass wire sieve, having 20 meshes per inch, and kept on a dish of about 2 litres capacity. With a wooden spatula, the earth

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paste, spread on the sieve, is stirred and washed with distilled water from a wash bottle. All the fine earth passes into the dish, while the minerals remain on the sieve. The separation of fine earth and minerals is carried out with 500 cc. of distilled water.

The fine earth suspension is evaporated on a sand bath, and then dried on a water bath. When dry the earth adhering to the sides of the dish is easily removed by light scratching with a nickel spatula. The scraped fine earth is lightly triturated in the dish with a pestle and then completely transferred to a weighed beaker. The fine earth in the weighed beaker, is dried at 100°C. to constant weight.

The minerals remaining on the sieve are also dried at 100°C., transferred to a watch glass and weighed.

The moisture in air dried earth is estimated in another portion of the earth. About 2 grams of the earth are weighed out in a nickel dish, dried at 100°C. to constant weight and the moisture content calculated. From 6 to 8 hours are required for drying the earth at 100°C.

Results :—

Weight of beaker + earth = 163·5900 grams.
Weight of beaker = 60·4356 grams.

∴Weight of earth used = 103·1544 grams.

Minerals :—

Weight of watch glass + minerals = 24·0055 grams.
Weight of watch glass = 14·2428 grams.

∴Weight of minerals = 9·7627 grams.

Hence the percentage of minerals = $\frac{9·7627 \times 100}{103·15} = 9·46.$

Fine earth :—

Weight of beaker + fine earth = 151·7888 grams.
Weight of beaker = 60·4356 grams.

∴Weight of fine earth = 91·3532 grams.

Hence the percentage of fine earth = $\frac{91·353 \times 100}{103·15} = 88·563$

Moisture :—

Weight of nickel dish + earth = 52·0673 grams.
Weight of nickel dish = 49·5644 grams.

∴Weight of earth = 2·5029 grams.

After drying at 100°C.
Weight of nickel dish + earth = 52·0282 grams.
Weight of nickel dish = 49·5652 grams.

Weight of dry earth = 2·4630 grams.
Hence weight of moisture = 2·5029 − 2·4630 = 0·0399 grams.

Hence percentage of moisture = $\frac{0·0399 \times 100}{2·5029} = 1·59.$

B. *Mechanical analysis* (Schloesing's method). *Estimation of sand, organic debris, clay, and humus.*

About 10 grams of fine earth are weighed out in a porcelain dish of about 100 cc. capacity and moistened with 5 to 10 cc. of

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distilled water. The paste is broken up with a rubber tipped glass rod and 20 to 30 cc. of water are then added. The mixture is kneaded, allowed to stand for about 10 seconds and the supernatant turbid liquid is decanted in a 250 cc. beaker. To the sediment in the dish 30 cc. of water are added and after kneading and waiting for 10 seconds, the turbid liquid is decanted as before. The operation is repeated till the distilled water mixed with the heavy sediment in the dish does no longer become turbid. *By these operations the clay with fine sand is transferred to the beaker.*

The heavy sediment in the dish, is treated with nitric acid (1 part HNO_3 sp. gr. 1·42+1 part water), till the limestone, if present, is completely decomposed. The mixture after treatment with acid is transferred to the 250 cc. beaker containing the suspension of clay and fine sand. The acid coagulates the clay in suspension and the sand, clay, organic debris and humus settle down in the beaker.

The contents of the beaker are filtered and the residue is freed from nitric acid and lime salts by washing it with distilled water till the residue again shows sign of going into suspension.

The residue is transferred to a beaker of about 2 litres capacity using distilled water. 1 cc. of ammonia (sp. gr. 0·88) and 1000 cc. of distilled water are added. The mixture is stirred and allowed to stand for 24 hours. By this operation sand and organic debris settle down, humus goes in solution, while clay remains in suspension. After standing for 24 hours, the supernatant liquid is carefully syphoned off and collected in a 6 litre flask. After syphoning 1 cc. of ammonia and 1,000 cc. of water are again added to the sediment in the beaker, the mixture stirred and after 24 hours' standing, the supernatant liquid is decanted and added to that previously collected. In all, three such operations are sufficient to remove all clay. If necessary these are repeated, the end point being judged by the more or less turbid aspect of the liquid.

The residue of sand and organic debris remaining behind in the 2 litre beaker is dried on a water bath, transferred to a large porcelain crucible and dried to constant weight at 100°C. The residue is then ignited, till the organic matter is completely oxidised and the crucible is weighed. From the weights the percentages of sand and organic debris are calculated.

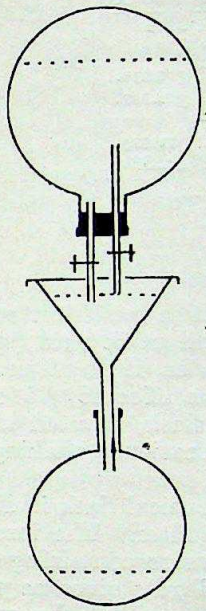
To the turbid liquid in the 6 litre flask, saturated solution of potassium chloride is added (10 cc. of saturated KCl per 1000 cc. of the turbid liquid). The clay coagulates and settles, while humus remains in solution. The mixture is filtered and the clay is collected on a weighed filter paper. The filter paper with clay is dried to constant weight at 100°C. From the weights the percentage of colloidal clay is calculated.

To the filtrate containing humus in solution hydrochloric acid is added (5 cc. of HCl sp. gr. 1·16 per 1,000 cc. of the filtrate). Humus is precipitated as a brownish black mass. The mixture is filtered and the humus is collected on a weighed filter paper. The filter paper with humus is dried to constant weight at 100°C. From the weights the percentage of humus is calculated.

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In the above procedure the weighed filter paper is prepared by washing a 15 cm. filter paper with 4,000 cc. of distilled water and drying it to constant weight at 100°C. For the filtration of clay and humus the following arrangement is used.



—6-litre flask containing clay suspension after coagulation.

—covered funnel with tared filter paper.

—filtrate.

The above is self explanatory and facilitates filtration of clay which usually requires from two to three days.

Results :—

NOTE.—Although fine earth is used in the above mechanical analysis, the results of analysis are always expressed with reference to the normal earth and not with reference to fine earth.

Weight of watch glass + fine earth	=	25·4642 grams.
Weight of watch glass	=	14·2428 grams.
Weight of fine earth used	=	11·2214 grams.

Sand and organic debris

Weight of crucible + sand + organic debris	=	67·4596 grams.
Weight of crucible	=	56·7922 grams.
Weight of sand and organic debris	=	10·6674 grams.
Weight of crucible + sand (after heating)	=	67·0092 grams.
Weight of sand	=	10·2170 grams.
Weight of organic debris	=	10·6674 − 10·2170
	=	0·4504 grams.
Hence percentage of sand	=	$\frac{10·217 \times 88·563}{11·2214} = 80·63$,
and percentage of organic debris	=	$\frac{0·4504 \times 88·563}{11·2214} = 3·56$

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Clay

Weight of filter paper + clay = 4·3986 grams.
Weight of filter paper = 4·0880 grams.

Weight of clay = 0·3106 grams.
Hence percentage of clay = $\frac{0·3106 \times 88·563}{11·2214}$ = 2·45.

Humus

Weight of filter paper + humus = 4·2592 grams.
Weight of filter paper = 4·2092 grams.

Weight of humus = 0·0500 grams.
Hence percentage of humus = $\frac{0·05 \times 88·563}{11·2214}$ = 0·40.

C. *Chemical analysis.*

1. *Preparation of nitric acid solution.*

50 grams of the fine earth are weighed out in a 750 cc. conical flask. The earth is moistened with water, and nitric acid (sp. gr. 1·42) is added, drop by drop, till the carbonates, if at all present, are decomposed. When the decomposition is effected, 75 cc. of nitric acid (sp. gr. 1·42) are added and the flask, covered with a funnel, is heated on a water bath, with occasional shaking, for 24 hours.

At the end of 24 hours, the liquid in the conical flask is diluted with 30 cc. of water and decanted through a filter. The insoluble residue is washed by decantation with hot water containing 5 cc. of nitric acid (sp. gr. 1·42) per litre, till the filtrate gives no yellow colour due to iron. When the washing is complete, the residue is transferred to the filter and kept aside.

The filtrate is evaporated in a dish on a sand bath and the residue is dehydrated on a water bath for two hours. After dehydration, add 5 cc. of nitric acid (sp. gr. 1·42) and 100 cc. of hot water. Boil and filter. Wash the insoluble residue with hot water containing nitric acid as before, and collect and keep aside the insoluble residue of silica, on a separate filter paper.

The filtrate, in the above operation, is subjected to a second evaporation in a similar manner in order to remove the last traces of silica from solution.

The filtrate, from which silica has been removed is cooled and made upto 500 cc. *This nitric acid solution is used in the chemical analysis, when required.*

The main portion of the earth, together with the two silica residues from the two evaporations are transferred to a nickel dish. The dish is heated at first on a small flame to burn off papers and then the residue is ignited at full blast to constant weight.

Results :—

(Cf. Note under Results of mechanical analysis, p. 367.) Chemical analysis.

Weight of beaker + fine earth = 151·7888 grams.
Weight of beaker = 103·5260 grams.

Weight of fine earth used in chemical analysis = 48·2627 grams.

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Main portion insoluble in HNO_3

Weight of nickel dish + residue + + filter ash (3 papers)	=	91·2870 grams.
Weight of nickel dish	=	49·5628 grams.
Weight of filter ash from 3 papers	=	0·0282 grams.
		49·5910 grams.
∴ Weight of residue	=	41·6960 grams.

Hence percentage of main portion insoluble in HNO_3 = $\frac{41·696 \times 88·563}{48·263} = 76·514$

N.B.—The result ' of main portion insoluble in nitric acid ' is not reported under ' insoluble in nitric acid '. For calculating ' insoluble in nitric acid, see calculations and remarks p. 375.

2. *Estimation of Aluminium and Iron.*

50 cc. of the nitric acid solution are treated in a porcelain dish with 5 N sodium hydroxide solution until strongly alkaline, boiled, diluted with 100 cc. of hot water, and filtered. The precipitate contains the iron as hydroxide, while the filtrate contains the aluminium as aluminate. The precipitate is dissolved in hot 5 N hydrochloric acid and the iron is reprecipitated as hydroxide with sodium hydroxide. The precipitate of iron hydroxide is freed from chlorides by washing with hot 2 per cent ammonium nitrate solution and the two filtrates containing the aluminium as aluminate are combined together.

The filtrate containing the aluminium is acidified with 5 N nitric acid. 20 cc. of 20 per cent ammonium nitrate, one macerated filter paper and a few drops of methyl red (0·2 per cent alcoholic solution) are added. The mixture is heated to 66°C and 5 N ammonium hydroxide is added till alkaline. The precipitate is filtered, washed with hot 2 per cent ammonium nitrate solution, ignited wet and weighed as alumina (Al_2O_3). By adopting this procedure filtration of the precipitate and final ignition to a fine powder are rendered easy.

The precipitate of iron hydroxide is dissolved in hot 5 N sulphuric acid in a 500 cc. Erlenmeyer flask. The solution is boiled and hydrogen sulphide is passed till all the iron is reduced. When the reduction is complete, the mixture is boiled to expel the sulphuretted hydrogen, cooled while passing a current of carbon dioxide and titrated against standard potassium permanganate solution.

Results:—

50 cc. of the nitric acid solution are used.

Aluminium

Weight of crucible + Al_2O_3 + ash	=	26·8912 grams.
Weight of crucible	=	26·8248 grams.
Weight of filter ash	=	0·0094 grams.
Weight of ash of macerated filter	=	0·0023 grams.
		26·8365 grams.
∴ Weight of Al_2O_3	=	0·0547 grams.
Hence percentage of Al_2O_3	=	$0·0547 \times 10 \times \frac{88·563}{48·263}$
	=	1·004.

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Iron

The solution after reduction required = 27·8 cc. of 0·09752 N $KMnO_4$
= (27·8 × 0·09752) cc. $\frac{N}{1}$ $KMnO_4$.

1 cc. $\frac{N}{1}$ $KMnO_4$ = 0·07984 gram Fe_2O_3.

Hence percentage of Fe_2O_3 = (27·8 × 0·09752) × 10 × 0·07984 × $\frac{88·563}{48·263}$
= 3·972.

3. *Estimation of 'Combined Oxides' and Phosphorus.*

50 cc. of the nitric acid solution are transferred to a 500 cc. beaker. 20 cc. of 20 per cent ammonium nitrate and a few drops of methyl red (0·2 per cent alcoholic solution) are added. The mixture is heated to 66°C and 5 N ammonium hydroxide is added till alkaline. The precipitate contains the hydroxides of the trivalent metals, while calcium and magnesium remain in solution. The precipitate is redissolved in hot 5 N hydrochloric acid, one macerated filter paper is added and the trivalent metals are reprecipitated with ammonia as before. The precipitate is thoroughly washed with hot 2 per cent ammonium nitrate solution and the two filtrates containing calcium and magnesium are combined together and kept aside for their estimations.

The precipitate is ignited wet and weighed as 'combined oxides'.

The precipitate of 'combined oxides' is fused with six times its weight of a mixture consisting of four parts of anhydrous sodium carbonate and one part of pure silica. The mixture is fused, the melt is extracted with 1 per cent ammonium carbonate solution and filtered. The filtrate contains all of the phosphoric acid and a very little silicic acid. The filtrate is acidified with 5 N hydrochloric acid, evaporated to dryness on a water bath, and the residue is moistened with a few drops of 5 N hydrochloric acid. The mass is dehydrated on the water bath for two hours and then extracted with 100 cc. of hot water. The mixture is filtered and the slight residue of silica is washed with hot water. The filtrate now contains all of the phosphoric acid.

The filtrate is concentrated to about 50 cc., 5 cc. of 5 N hydrochloric acid, 20 cc. of 'magnesia mixture' (55 grams $MgCl_2$. 6 H_2O are dissolved in 650 cc. water, adding 105 grams of ammonium chloride, and made up to 1,000 cc.) and 10 cc. of 2 N ammonium chloride are added. The mixture is boiled and 5 N ammonium hydroxide solution is added drop by drop, slowly so as to obtain a crystalline precipitate, the dropwise addition of ammonia being continued till the mixture is alkaline: one-third the solution's volume of 5 N ammonium hydroxide is then added and the mixture is allowed to stand for four hours. The precipitate of magnesium ammonium phosphate is filtered, washed with 2·5 per cent ammonia to remove chlorides, dried, ignited separately from the filter paper and weighed as magnesium pyrophosphate, $Mg_2P_2O_7$.

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Results :—

'*Combined oxides*' i.e. (Al_2O_3 + Fe_2O_3 + P_2O_5 + Mn_3O_4, etc.) 50 cc. of nitric acid solution are used.

Weight of crucible + oxides + ash	=	26·0688 grams.
Weight of crucible	=	25·6800 grams.
Weight of filter ash	=	0·0094 grams.
Weight of ash from macerated filter paper	=	0·0094 grams.
		25·6988 grams.
∴ Weight of combined oxides	=	0·3700 grams.
Hence percentage of combined oxides	=	$0{\cdot}3700 \times 10 \times \frac{88{\cdot}563}{48{\cdot}263}$
	=	6·790.

NOTE.—(The percentage of combined oxides is not reported in the final results. Its value is used as a check on Al_2O_3, Fe_2O_3, P_2O_5, and Mn values determined separately. The 'combined oxides' value is *slightly* greater than the sum of oxides due to Al, Fe, P, and Mn, indicating presence of traces of titanium and other trivalent metals. As these are considered of no value for the investigation of mineral metabolism in animals, they are not determined.)

P_2O_5.

Weight of crucible + $Mg_2P_2O_7$ + ash	=	25·8271 grams.
Weight of crucible	=	25·6802 grams.
Weight of ash	=	0·0094 grams.
		25·6896 grams.
∴ Weight of $Mg_2P_2O_7$	=	0·1375 grams.
But 1 gram $Mg_2P_2O_7$	=	0·6379 gram P_2O_5.
Hence percentage of P_2O_5	=	$0{\cdot}1375 \times 10 \times 0{\cdot}6379 \times \frac{88{\cdot}563}{48{\cdot}263}$
	=	1·610.

4. *Estimation of Calcium and Magnesium.*

The filtrate obtained in the estimation of 'combined oxides' and containing calcium and magnesium is evaporated to about 100 cc. 5 cc. of 5 N hydrochloric acid and 20 cc. of a saturated ammonium oxalate solution are added. The mixture is boiled. 5 N ammonium hydroxide solution is added drop by drop till alkaline and the mixture is heated on a water bath for one hour. The solution is filtered. To the filtrate are added 5 cc. of saturated ammonium oxalate and 5 N ammonium hydroxide till alkaline. The filtrate is reheated on the water bath for 15 minutes to ascertain quantitative precipitation of calcium as oxalate. At this stage, the clear filtrate contains magnesium.

The precipitate of calcium oxalate is dissolved in hot 5 N hydrochloric acid. Dilute the solution to 100 cc. add 2 cc. of saturated ammonium oxalate and make the solution alkaline by adding 5 N ammonium hydroxide. Digest on the water bath as in the first precipitation and filter. Wash the precipitate of calcium oxalate with hot water, adding one drop of ammonium oxalate solution each time the funnel is filled. The filtrate in the second precipitation is combined with the previous filtrate containing magnesium.

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The calcium oxalate precipitate is dissolved in cold 2 N sulphuric acid. 50 cc. of 2 N sulphuric acid are then added. The mixture is warmed and titrated against standard potassium permanganate.

Estimation of Magnesium.

To the filtrate, after separation of calcium, add 25 cc. of nitric acid (sp. gr. 1·42) and evaporate to 50 cc. Nitric acid removes excess of ammonium salts and thus renders concentration of the solution possible without crystallisation when cooled. To the concentrated solution add 50 cc. of 5 N hydrochloric acid and then 5 N ammonium hydroxide till alkaline. If a precipitate of magnesium hydroxide forms, repeat the addition of hydrochloric acid and ammonia until the solution can be made alkaline without the formation of a precipitate. Next make the solution acidic to methyl orange with 5 N hydrochloric acid. To the acidic solution add 10 cc. of 2 N ammonium chloride and 20 cc. of 10 per cent ammonium phosphate. At this stage the solution should be sufficiently acidic to prevent the formation of a permanent precipitate on adding the phosphate solution. The mixture is boiled. 5 N ammonium hydroxide is added drop by drop till alkaline and one-third the solution's volume of 5 N ammonium hydroxide is added and the mixture is allowed to stand for four hours. The precipitate is filtered and the filtrate is subjected to a second precipitation as before, to ensure that all the magnesium is quantitatively precipitated. The precipitate of magnesium ammonium phosphate is washed with 2·5 per cent ammonium hydroxide to remove chlorides, dried, ignited separately from the filter paper and weighed as magnesium pyrophosphate.

Results :—

50 cc. of nitric acid solution are used.

The solution of calcium oxalate in sulphuric acid required = 9·1 cc. of 0·09752 N $KMnO_4$.

= $(9{\cdot}1 \times 0{\cdot}09752)$ cc. $\frac{N}{1}$ $KMnO_4$.

1 cc. of $\frac{N}{1}$ $KMnO_4$ = 0·02804 gram CaO.

Hence percentage of CaO = $(9{\cdot}1 \times 0{\cdot}09752) \times 10 \times 0{\cdot}02804 \times \frac{88{\cdot}563}{48{\cdot}263}$

= 0·457.

Magnesium :—

Weight of crucible + $Mg_2P_2O_7$ + ash	=	26·6474 grams.
Weight of crucible	=	26·5308 grams.
Weight of ash	=	0·0044 grams.
		26·5852 grams.
∴ Weight of $Mg_2P_2O_7$	=	0·0622 grams.
But 1 gram $Mg_2P_2O_7$	=	0·3621 gram MgO.

Hence percentage of MgO = $0{\cdot}0622 \times 10 \times 0{\cdot}3621 \times \frac{88{\cdot}563}{48{\cdot}263}$

= 0·413.

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5. *Estimation of total Potash and total Soda present in the salt-lick or earth.*

0·5 gram of the fine earth is decomposed by the fusion method of J. Lawrence Smith. Potassium is estimated by precipitation as potassium perchlorate, while sodium is determined by difference.

Results :—

Weight of weighing bottle + fine earth	=	36·5906 grams.
Weight of weighing bottle	=	36·0844 grams.
∴ Weight of fine earth used	=	0·5062 grams.
Weight of dish + (KCl + NaCl) + + insoluble residue	=	37·3542 grams.

The alkali salts are dissolved in water and filtered. The dish is dried and weighed. The filter containing the insoluble residue is incinerated.

Weight of empty dish	=	37·3292 grams.
Weight of crucible + ash of filter + + insoluble residue	=	26·8274 grams.
Weight of crucible	=	26·8228 grams.
Weight of ash	=	0·0044 grams
		26·8272 grams.
∴ Weight of insoluble residue	=	26·8274 − 26·8272
	=	0·0002 grams.
Hence weight of (KCl + NaCl)	=	37·3542 − 37.3292 − 0·0002
	=	0·0248 grams.
Hence percentage of (KCl + NaCl)	=	$0·0250 \times \frac{88·563}{0·5062}$
	=	4·374.
Weight of Gooch crucible + $KClO_4$	=	13·5056 grams.
Weight of Gooch crucible	=	13·4592 grams.
∴ Weight of $KClO_4$	=	0·0464 grams.
But 1 gram of $KClO_4$	=	0·5381 gram KCl.
∴ percentage of KCl	=	$0·0464 \times 0·5381 \times \frac{88·563}{0·5062}$
	=	4·368.
and percentage of NaCl	=	4·374 − 4·368
	=	0·006 grams.
But 1 gram KCl	=	0·6317 gram K_2O
and 1 gram NaCl	=	0·5303 gram Na_2O.
∴ percentage of K_2O	=	4·368 × 0·6317 = 2·760
and percentage of Na_2O	=	0·006 × 0·5303 = 0·003.

6. *Estimation of Manganese.*

Transfer 5 cc. of nitric acid solution to a beaker, add 25 cc. of nitric acid (1 part HNO_3 sp. gr. 1·42 + 3 parts water) and about 0·5 gram sodium bismuthate. Heat until the permanganate colour disappears. Add a few drops of 10 per cent sodium bisulphite solution to clear the solution and again boil to expel oxides of nitrogen. Cool to room temperature, again add about 0·5 gram sodium bismuthate and stir. When the maximum permanganate colour is developed, filter through a Gooch crucible containing an asbestos mat that has been ignited, treated with 4 per cent potassium permanganate, and washed with water. Wash the precipitate with

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dilute sulphuric acid (25 cc. of H_2SO_4 sp. gr. 1·84 diluted to 1 litre, a few drops of N/10 $KMnO_4$ being added to colour the dilute acid *faintly*) until the washings are colourless. The filtrate is transferred to a 100 cc. Nessler tube and diluted to 100 cc. with the above mentioned dilute sulphuric acid. The colour of this solution is matched with a standard solution of potassium permanganate prepared by diluting 0·2, 0·3, 0·4 cc. etc. of standard permanganate in another Nessler tube, to 100 cc. with dilute sulphuric acid. The standard potassium permanganate is prepared by dissolving 0·2877 gram $KMnO_4$ in distilled water and diluting to 1 litre.

Results :—

1 cc. of standard $KMnO_4$ = 0·0001 gram Mn.

The colour of 5 cc. of nitric acid solution after bismuthate treatment and dilution to 100 cc. was matched with 1·6 cc. of standard $KMnO_4$ diluted to 100 cc.

Hence percentage of Mn

$$= 1{\cdot}6 \times \frac{500}{5} \times 0{\cdot}0001 \times \frac{88{\cdot}563}{48{\cdot}263} = 0{\cdot}147.$$

7. *Estimation of Sulphur.*

50 cc. of nitric acid solution are transferred to a 250 cc. beaker, 5 cc. of 5 N hydrochloric acid are added, and the mixture is boiled. To the boiling solution 10 cc. of 20 per cent barium nitrate solution are added, and the mixture allowed to stand at room temperature for 12 hours. The precipitate of barium sulphate is filtered, washed with hot water to remove chloride, dried, ignited and weighed as barium sulphate.

8. *Estimation of total 'Acid and Water soluble' Chlorine.*

10 grams of fine earth are weighed out in a 250 cc. conical flask. Dilute nitric acid (1 part HNO_3 sp. gr. 1·49 + 40 parts water) is added till the limestone, if present, is completely decomposed, when 100 cc. of dilute nitric acid are added. The mixture is heated on a water bath for one hour. The mixture is filtered and the residue is washed with hot water. The filtrate is rendered alkaline with $\frac{N}{1}$ sodium carbonate and allowed to stand for half an hour. The mixture is filtered and the residue washed with hot water. The filtrate is evaporated to 50 cc., faintly acidified with acetic acid, and titrated against standard silver nitrate using 5 drops of 1 per cent potassium chromate as the indicator.

9. *Estimation of Soluble Silica.*

About 2 grams of fine earth are weighed out in a porcelain dish and a mixture of 100 cc. of water and 50 cc. of sulphuric acid (sp. gr. 1·84) is added. The dish is covered with an inverted funnel and heated over an asbestos wire gauze until dense fumes of sulphuric acid vapours are evolved. The contents of the dish are allowed to cool, 150 cc. of water and 3 cc. of hydrochloric acid (sp. gr. 1·16) are added. The mixture is boiled, with constant

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stirring for 15 minutes, filtered and the residue washed with hot water until free from sulphate. After washing the residue is digested with 100 cc. of 5 per cent sodium carbonate on a water bath for 15 minutes and filtered. (The filtrate is tested for unchanged carbonate, otherwise the residue is digested a second time with 5 per cent sodium carbonate.) The residue, after digestion, is washed twice with 5 per cent sodium carbonate solution and then with hot water until free from carbonate. If the filtrate is turbid, a little alcohol is added, after which the filtrate will run through clear.

The alkaline filtrate contains soluble silica. It is acidified with hydrochloric acid (sp. gr. 1·16) and evaporated to dryness. The residue is dehydrated at first on a water bath for one hour and then at 110°C for two hours. The residue is digested with 100 cc. of hot water and the mixture filtered. The residue is washed with hot water until free from chloride, dried, ignited and weighed.

Results :—

Weight of weighing bottle + fine earth	= 38·9698 grams.
Weight of weighing bottle	= 36·5906 ,,
∴ Weight of fine earth used	= 2·3792
Weight of crucible + silica + ash	= 25·0314 grams.
Weight of crucible	= 24·7462 grams.
Weight of ash	= 0·0094 ,,
	24·7556
∴ Weight of silica	= 0·2758 gram.

Hence percentage of soluble silica $= \frac{0{\cdot}2758 \times 88{\cdot}563}{2{\cdot}3792} = 10{\cdot}267.$

10. *Estimation of Moisture and Organic Matter in Fine Earth.*

About 2·5 to 3·5 grams of the fine earth are ignited to constant weight in a crucible.

Results :

Weight of fine earth used	= 3·3396 grams.
Weight of crucible + fine earth before heating	= 60·1317 grams.
Weight of crucible + fine earth after heating	= 59·9662 ,,
∴ Weight of moisture and organic matter	= 0·1655 ,,

Hence percentage of moisture and organic matter $= \frac{0{\cdot}1655 \times 88{\cdot}563}{3{\cdot}3396} = 4{\cdot}389.$

11. *Estimation of Carbon Dioxide.*

Carbon dioxide is estimated by the Schrotter apparatus using about 2 grams of fine earth.

12. *Estimation of 'Insoluble in Nitric Acid'.*

The 'insoluble in nitric acid' is calculated from analytical data determined separately:—

The analytical data for the earth as analysed by the above method are as follows:—

'Main portion insoluble in HNO_3'	= 76·514 per cent.
Soluble SiO_2	= 10·267 ,,

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Total K_2O	=	2·760 per cent.
Total Na_2O	=	0·003 ,,
Cl (water and acid soluble)	=	nil.

To calculate 'insoluble in HNO_3' add total Na_2O and K_2O, and from the sum subtract Na_2O equivalent to chlorine.

$$2{\cdot}760 + 0{\cdot}003 = 2{\cdot}763 - 0 = 2.763.$$

Add this value to soluble silica and subtract the value obtained from main portion insoluble in nitric acid

$$2{\cdot}763 + 10{\cdot}267 = 13{\cdot}030$$
$$\text{and } 76{\cdot}514 - 13{\cdot}030 = 63{\cdot}484.$$

The value 63·84 percent is reported as 'insoluble in nitric acid' and evidently represents all the constituents, except sodium and potassium, insoluble in nitric acid that have not been determined. The value represents *chiefly sand* mixed with *slight traces of minerals undecomposed by* nitric acid.

D. *Analysis of Water soluble Substances present in the Salt-lick or Earth.*

1. *Estimation of Water soluble Organic and total Inorganic Matter.*

100 grams of the soil (not fine earth) are weighed out in a 500 cc. conical flask, and 250 cc. of water are added. The flask is stoppered, shaken thoroughly and allowed to stand for 24 hours. After 24 hours the mixture is filtered. 50 cc. of the filtrate are evaporated, the residue is dried to constant weight at 100°C in a steam oven. The residue is ignited at *a low red heat* to drive off organic matter, cooled and weighed for total inorganic solids.

Results :

Weight of soil used = 104·4350 grams.

After extraction with 250 cc. of water, 50 cc. of the filtrate gave the following results:

Weight of dish + residue	=	60·2208 grams.
Weight of dish	=	60·1411 ,,
Weight of dish + inorganic matter in the residue	=	60·1988 grams.
∴ Weight of organic matter	=	60·2208 − 60·1988 = 0·0220 grams,
and weight of inorganic matter	=	60·1988 − 60·1411 = 0·0577 ,,

Hence percentage of total water-soluble organic matter

$$= 0{\cdot}0220 \times 5 \times \frac{100}{104{\cdot}44} = 0{\cdot}105,$$

and percentage of total water-soluble inorganic matter

$$= 0{\cdot}0577 \times 5 \times \frac{100}{104{\cdot}44} = 0{\cdot}2763$$
$$= 0{\cdot}276.$$

2. *Estimation of Colloidal Silica and Inorganic Matter (other than alkali chloride, alkali carbonate and gypsum).*

The residue, remaining in the dish after removing organic matter, is extracted with small quantities (10 cc.) of hot water. The filtrate allowed to cool and made up to 100 cc. The insoluble residue, on the filter paper, is dried, ignited in a crucible and weighed for silica and inorganic matter.

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Results :—

Weight of crucible + residue + ash	=	26·8892 grams.
Weight of crucible	=	26·8228 ,,
Weight of ash	=	0·0094 ,,
		26·8322 ,,
∴ Weight of residue	=	0·0570 ,,

Hence percentage of colloidal silica and other inorganic matter

$$= 0{\cdot}0570 \times 5 \times \frac{100}{104{\cdot}44} = 0{\cdot}2728.$$

3. *Estimation of Water soluble Alkali Carbonate.*

25 cc. of the filtrate obtained in (2) are titrated against 0·1 N hydrochloric acid using methyl orange as an indicator. From the titre reading the result is calculated and reported as percentage of sodium carbonate.

4. *Estimation of Water soluble Alkali Chloride.*

25 cc. of the filtrate obtained in (2) are titrated against 0·1 N silver nitrate using 5 drops of 1 per cent potassium chromate as an indicator or 25 cc. of the filtrate are acidified with dilute nitric acid (1 part HNO_3 sp. gr. 1·42 + 4 parts water) and chlorine is precipitated and weighed as silver chloride. The result is reported as percentage of NaCl.

Results :

Weight of Gooch crucible + AgCl	=	13·4638 grams.
Weight of Gooch crucible	=	13·4634 ,,
∴ Weight of AgCl	=	0·0004 gram.
1 gram AgCl	=	0·4078 gram NaCl.

Hence percentage of NaCl = $(0{\cdot}0004 \times 4) \times 5 \times 0{\cdot}4078 \times \frac{100}{104{\cdot}44} = 0{\cdot}0031.$

5. *Estimation of Gypsum.*

The gypsum content is calculated by difference as follows:—

Total water-soluble inorganic matter = 0·2763 per cent.

The sum of percentages of colloidal silica etc., alkali carbonate, and alkali chloride is :

0·2728 + 0 + 0·0031	=	0·2759.
Hence percentage of gypsum	=	0·2763 − 0·2759
	=	0·0004.

i.e. gypsum is present in traces.

The results are reported as above under Analysis XXXIX.

(*To be continued*).

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REVIEWS.

I. THE BIRDS OF NIPPON, Vol. I, Part 5. By PRINCE TAKA-TSUKASA. H. F. & G. Witherby, London.

There are at present available to English readers only two books on the Birds of Japan, the earlier by Temminck and Schlegel (1845-1850) and the latter by Seebohm (1890) and both these are out of print and difficult to procure. A more recent work by Dr. Uchida was unfortunately for the cause of international science written in Japanese and has not been available to western ornithologists.

There is every reason, therefore, to welcome the appearance of a beautifully produced book in English on the birds of Japan by Prince Taka-Tsukasa, the president of the Ornithological Society of Japan. This work will be completed in five volumes. It will deal with bird-life in all the Japanese possessions from Sakhalin and the Kurile Islands in the north down to Formosa and the Loo-Choo Islands in the south, from Korea in the west to the Bonin Islands in the east, and in addition the various groups of Japanese mandatory islands. Its scope is therefore defined in the political rather than in the strictly zoo-geographical sense. Every species in this Japanese Empire is to be figured in colour together with the eggs and chicks of all breeding species. Distributional maps and phtogravure plates of nests and types of country will further embellish a text which is to be on the most complete scale.

We have hitherto received the first four parts which deal with the introduction, physiography and the history of Japanese ornithology in addition to instalments of the main text. This starts with the order *Galli* and so far treats of the Megapode, various pheasants and the Japanese Quail, the last of these being the only species included in the Indian list. The account of each species is very complete. It starts with the transcription in full of the original description with which the scientific name was published, a useful feature too long for inclusion in ordinary books. It continues with a synonymy and list of principal references, the principal vernacular names in different languages, and the usual descriptions of plumage and measurements. The distribution, the nidification and a long account of habits follow and the account ends with various notes including the history of the species in captivity.

In these accounts we must be grateful to Prince Taka-Tsukasa for his industry in collecting a wealth of information both from published and unpublished sources. But unfortunately this material has not always been handled with sufficient discretion. Its very wealth defeats its own object for the sections often become long and straggling and hard to comprehend. A little compression, some omissions of redundant material and more clearness of summary would all have been to the good.

The preliminary discussion of the limits of the genus *Syrmaticus*, for instance, occupies eighteen pages before the author approaches the account of the pheasants included in it. It is difficult to follow. The train of thought is far from consecutive and at the end the reader is left with the impression that these eighteen pages should have been treated as the preliminary notes from which the author wrote his final account and decision.

There are other points to which criticism might be directed but these may be well disregarded in appreciation of the fact that Prince Taka-Tsukasa is giving ornithologists a most beautiful book. The cost of production will be very heavy and the author cannot expect to see any return from his expenditure as the edition is limited to 250 copies.

H. W.

II. NATURAL HISTORY OF CENTRAL ASIA, vol. x. 'THE REPTILES OF CHINA'. By CLIFFORD H. POPE. Pp. xlvii+604, 77 text-figures, 27 plates and 1 map. The American Museum of Natural History, New York, May 11, 1935. Price $ 10.

From over one hundred papers that have appeared on different groups of animals, zoologists are already familiar with the wealth of material obtained

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and the valuable biological and ecological data collected by the members of 'The Central Asiatic Expeditions' of the American Museum of Natural History. The Expedition explored the natural history of Mongolia and China in the years 1921-1930. Field work was conducted in Mongolia during the summers and in China during the winter months.

The final reports of the Expedition embrace a series of 12 quarto volumes. Of these the volumes dealing with 'The New Conquest of Central Asia' (vol. i), 'The Geology of Mongolia' (vol. ii) and 'The Permean of Mongolia' (vol. iv) appeared some years ago, while the tenth volume of the series reviewed here has appeared only recently.

The Reptiles of China (Turtles, Crocodilians, Snakes, Lizards) are treated in five parts in the work under review. Part I comprising the general introduction deals with the collecting of the material in different Provinces and the methods followed in describing the species. The second part, which deals with the systematic account of the species and subspecies of Chelonians, Crocodilians and Snakes, is very comprehensive. It includes the synonymy, description, distribution, habits, habitats and the material examined of each species. Remarks are also made, wherever possible, on details not included in the above descriptive headings. In the third part a resumé of the natural history of Chinese snakes is given and attention is directed to their ecology, sexual characters and maxillary teeth. Lists of species and subspecies of snakes by Provinces is also included in this part. Part IV deals with lizards and includes an annotated check list of the species in which information is recorded as to the type-locality, distribution and material examined of each species. The final part comprises appendices, such as maps, list of localties, bibliography, index, etc.

The special feature of this work lies in the fact that the author himself worked in the field so that he imparts to his readers a first-hand knowledge of the natural history of the animals with which he deals. The work is of a monographic nature, as it presents a systematic study not only of the reptiles collected by the author himself but also of the Chinese reptiles in the larger museums throughout the world. Pope's excellent monograph is absolutely indispensable to the students of Chinese and Oriental herpetology. The treatment of the subject is admirable, the figures are neat and clear, and the get-up is all that could be desired. Mr. Pope deserves to be congratulated on the production of such a magnificent piece of work. He has indeed laid all herpetologists under a deep debt of gratitude.

S. L. H.

III. AUF STILLEN PFADEN (GUJA). By WALTER VON SANDEN. 9¼ in. × 6¼ in. 123 pp., 104 photos in the text. Gräfe und Unzer Verlag, Koenigsburg (Prussia), 1935. Price RM. 4.80.

This book describes a cycle of the seasons as expressed in the natural history —principally bird-life—of a lake (Guja) in East Prussia. This is perhaps its chief interest to us in India. For though somewhat parochial in its scope it affords an example of what may be achieved in the way of pleasantly written and well-illustrated popular natural history books dealing with sections of our own country. It is the author's second book on the self-same locality and he rightly observes that it is not necessary to travel to distant lands in search of Nature; that a small portion of one's own homeland may easily provide opportunities and subjects for lifelong study and that although countries and environments may vary and Nature also appear in different garbs, yet the underlying truths of Nature are everywhere and always the same.

The author deals in a pleasant, but unfortunately sometimes rather too superficial, way with the lives and nesting habits of the Marsh Harrier (a winter visitor to India), the Bittern, the Coot and various other birds and mammals inhabiting the lake and its vicinity. Marsh Harriers are said to be very destructive to the eggs and young of other birds. Eggs of bitterns and young of black-throated divers and coots are amongst the worst sufferers at their hands. A brood of six young magpies was lifted by them, whilst two young harriers which died in the nest are also suspected to have been devoured by the family. A full clutch consists of 4 or 5 eggs—rarely 6. Incubation is done solely by the female. The nest in time becomes a filthy accumulation of excrements

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of the young and the remains of food brought in by the parents. The young leave the nest about two months after hatching.

Coots, says the author, are unloved and persecuted by hunters due to insufficient knowledge of their life-history. They are falsely stigmatised as being quarrelsome and thereby as driving away ducks from waters inhabited by themselves. As a matter of fact what really conduces to the diminution in the numbers of duck is the coot-hunts organised in their protection which result in frightening away all breeding birds from the lake. The best and most effective way of controlling coots would be to remove their eggs unostentatiously thus leaving the duck and other birds undisturbed.

The Bittern is said to 'boom' five times in succession, seldom more, when at the height of his courtship display. From his experience the author concludes that the Bittern is polygamous and that the male does not assist in the construction of the nest or in the incubation of the eggs. He thinks that many of the nests robbed by terrestrial animals such as foxes and weasels are located by them through following the footprints of human beings who have visited the nests before.

Crabs are said to be very sedentary and long lived. The author recognised one particular individual which he captured on the same spot thrice in two years.

One or two addled eggs are frequently found left behind in swans' nests which are so charged with foul gases as to explode like a hand-grenade on the slightest attempt to blow them!

A strong plea is made for the camera over the gun in the pursuit of nature study, but the author admits that he could never have secured the best of his photographs without the experience and cunning previously acquired as a hunter. Some of his photos, especially those of the nesting harriers and bitterns, are very good and the general format of the book is pleasing. We think it a pity that scientific names should have been so rigidly avoided throughout and only the German ones given; those unfamiliar with the latter are apt to be left in some doubt as to the exact species under reference.

S. A. A.

IV. A FLOWER BOOK FOR THE POCKET. By MACGREGOR SKENE; 380 pp.; 501 illustrations in colour, 28 in black and white; 12 text-figs. Oxford University Press, London: Humphrey Milford (1935). Price 7*s.* 6*d.* net.

Instances are not wanting of protests made by authors against uncalled for criticism on the plea of an erroneous view of the end and aim they had set before them. In the present case such a misrepresentation is not likely to occur for in a prefatory note entitled *How to use this book* Professor Macgregor Skene clearly states for whom the book is meant, and what service it will likely render them.

It is a book for beginners, and it opens with an explanation of the time-honoured classification of plants according to species, genera, and families, and with a useful survey of botanical terms and characters. This is followed by keys to all the British families (pp. 18-26), and all the important British genera (pp. 27-95). Then come descriptions of 844 species of British Wild Flowers according to families (pp. 98-366), and the book closes with a long list of names arranged alphabetically by way of index.

The book is excellent in every respect.

On account of its very excellence it is to be regretted that the author should have come to grief over a matter of minor importance; one, in fact, which might have been omitted without appreciably detracting from the value of the book. The transliteration of Greek names is uncertain—e.g., *ipsilon* appears as *i*, *u*, *y*—, and their derivation faulty—v.g., the *t* in ANTIRRHINUM is not *thita* but *taf*.

J. F. C.

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MISCELLANEOUS NOTES.

I.—THE LION IN BALUCHISTAN.

For many years it has been feared that the last of the Asiatic lions are those preserved in the Gir Forest. But in the *Field*, June 8, 1935, p. 1421, there is a record of one being recently observed near the Bolan Pass, south of Quetta in Baluchistan. The animal was seen at close quarters from a train by Admiral Philip Dumas, his wife and another lady. Since no other animal occurs in the country that could be mistaken for a lion, there is no reason to doubt the authenticity of the record. Admiral Dumas's letter was submitted to me for my opinion and published on my recommendation. The footnote to it, signed by the editor, embodies my reasons for believing there can be no doubt about the truth of the fact recorded, which will interest all Indian sportsmen and naturalists and is worth recording in a journal of higher standing than the paper in which it first appeared.

ZOOLOGICAL DEPARTMENT OF THE
BRITISH MUSEUM (NAT. HIST.), R. I. POCOCK, F.R.S.
LONDON.
June 12, 1935.

[We print below Admiral Dumas's letter to the *Field* dated 8th June 1935 and a summary of the correspondence which appeared in the London *Times*.

"Sir,—It may interest many of your readers to hear that on February 19 last, while travelling by train from Hyderabad to Quetta, and shortly after passing Sibi, in the Bolan Pass, I, my wife, and a Miss Mayo, who was travelling with us, all clearly saw a maneless lion.

When first seen it was lying on the ground eating a goat, and was at about 25 yards' distance. It then arose, and, with the goat in its mouth, darted back about 10 yards, when it stood sideways on with head erect and the goat still in its mouth.

It was a large lion, very stocky, light tawny in colour, and, I may say, that no one of us three had the slightest doubt of what we had seen until, on our arrival at Quetta, many officers expressed doubts as to its identity, or to the possibility of there being a lion in the district.

Personally, I am convinced that we saw a lion.

Yours faithfully,
Betchworth, Surrey. PHILIP DUMAS,
Admiral.

(Lions were not uncommon both in Persia and Baluchistan in comparatively recent times. It is not impossible that a few survivors may still exist and though they are stated to be extinct, there is no definite proof of this. There being no tigers in Baluchistan a tiger cannot have been mistaken for a lion, and if the

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animal proves to be an Asiatic lion it will be a matter of very great interest.—Eds., *Field*)."

A similar letter, written to the London *Times* by Admiral Dumas, was the subject of considerable comment. A number of correspondents, some with first-hand knowledge of conditions in the area cast doubts on the likelihood of lions being found in the vicinity of the Bolan Pass, firstly because the terrain is wholly unsuitable and would provide nothing on which lions could habitually live because of the great scarcity of animal life in this inhospitable region. Again it is suggested by 2 or 3 correspondents that the animal seen by the Admiral was probably a panther. It is within the experience of those accustomed to seeing larger carnivores in the wild state that colour and pattern may be deceptive and that even the spotted coat of a panther may under certain conditions of light take on a uniformly drab appearance. Curiously enough a lion reported some years ago to have been killed on the Baluchistan border in the Bombay *Times* on investigation by the Society turned out to be a panther. Lions have not been seen or heard of in Baluchistan and there is no authenticated record of their occurrence in the province. It seems extraordinary that Admiral Dumas's record should be the isolated instance of their occurrence during the many years of British occupation and in spite of the fact that the Bolan area is continuously travelled over, resided in or visited by Railwaymen and others. The top of the Pass is only 25 miles from Quetta and there is a good road connection.

As regards the lion in Persia—Ronald Sinclair in a letter to the *Field* (reprinted in vol. xxxv, p. 671 of the Society's *Journal*) states that he was told by an Englishman that a party of American engineers concerned with Railway construction in the wild and mountainous region around Dizful in South-West Persia, came upon a full grown pair of lions; being unarmed they were compelled to beat a hasty retreat. This was in 1929. Edward Thomas in commenting upon Admiral Dumas's letter states that a lion cub was brought to an Arab village near Sanniyat, Mesopotamia, in 1916. In the same year he was told that a lion was shot in the Wadi Marshes towards the Pusht-i-kuh Mountains. He also refers to a letter published in *the Times* giving an account of a lion seen near Ahwaz in 1917. All these records relate to the Provinces of Luristan and Khuzistan on the Mesopotamia border in South-West Persia.—Eds.].

II.—A PAIR OF INDIAN LIONS PRESENTED TO THE BRITISH MUSEUM BY H. H. THE NAWAB OF JUNAGADH.

In a foot note to my paper 'The Lions of Asia' (*Journ., Bomb. Nat. Hist. Soc.*, xxxiv, pp. 638-65, 1930) the editors of this *Journal* announced that H. H. the Nawab of Junagadh was kindly arranging to shoot two Gir Forest lions for the National Collection, which, as I had announced, possessed at that time no specimen, complete with skin and skull, of this interesting beast. In 1934 a splendid adult pair was received from His Highness, to whom the

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trustees of the British Museum are greatly indebted for the generous gift, supplying a long-felt want. Since no report upon these specimens has yet been published and since every item connected with this vanishing race should be recorded, I take this opportunity of describing the skins and skulls as a supplementary note to my paper quoted above.

The lion carries a small mane of about the same size as in Capt. Smee's original example of this race, the hairs on the crest being about 2 in.; on the side of the neck 3 in., and lower down towards the fore leg up to 6 in. The fringe on the cheek and about the ears is rich ochreous; there is a good deal of black and grey in the crest on the fore-nape and a mixture of black, grey and tan extends across the front of the shoulder to the breast. The general colour of the body is dull tawny, not reddish or blackish tawny as in some Indian lions, the hairs being buff or greyish buff with darkened tips; the back is darker than the flanks, the lower flanks being clear buff, passing into creamy buff on the belly and inside the limbs; the forelimb is paler and greyer than the body, with a quantity of black hair between the digits and around the pads; the elbow-tuft, as in most Indian lions, is better developed in proportion to the size of the mane than in African lions, consisting of a whorl of black and grey hairs about 2¾ in. long, but there is no belly-fringe; the hind leg below the back and the paw are better tinted, more buffy than the fore leg; the tail above is grey, blackish-grey towards the end, and the tuft is small, its hairs less than 2½ in. long.

The lioness is decidedly better coloured than the lion, the individual hairs being richer buff and their black tips noticeably more pronounced; the fore leg is much more richly tinted and resembles the hind leg and the hairs of the belly are longer, with long white tips. These two skins supply further evidence of individual variation in the Indian lion. I am unfortunately unable to compare them with the skins kindly lent to me in 1930 by the Field Museum, Chicago, and by the Bombay Natural History Society; but from my description of those skins they seem to be decidedly tawnier and less grey than the skin of the Chicago specimen shot by the late Col. Faunthorpe and to resemble most closely the skin of the young lion presented to the Bombay Society by the Maharajah Kumar Sahib of Kotah. From Capt. Smee's skin they differ in having the coat much shorter and sleeker, although shot in February, and the colour noticeably greyer tawny instead of rufous tawny.

The measurements of the two dressed skins are as follows:—

♂ Head and body, 6 ft. 4 in.; tail, 2 ft. 8 in.; total 9 ft.

♀ Head and body, 5 ft. 10 in.; tail, 2 ft. 7 in.; total 8 ft. 5 in.

These dimensions agree tolerably closely with those of the skins entered in the table on page 656 of my paper.

The skulls, both fully adult, are perfectly typical of the Indian race, except that in the ♂ the auditory bullae are slightly more inflated, although, as in those previously described, flatter than in average skulls of African lions. They have the high sagittal crest running into two exceptionally thick ridges on the frontal bones;

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and since the publication of my previous paper I have been able to establish an additional characteristic of the skull of this lion, namely the shortness of the waist, the distance between the post-orbital processes and the suture between the frontal and parietal bones is less than in skulls of African lions which, in this particular, are more like the skulls of tigers. In the ♂ skull the intra-orbital foramen is duplicated on the right side only as in the two ♂ skulls sent by H. H. the late Maharajah Jam Sahib of Nawanagar to Rowland Ward; but in the ♀ skull the duplication occurs on both sides as in some other skulls.

The following table gives the measurements of the two skulls received from H. H. the Nawab of Junagadh together with those of the specimens sent by H. H. the late Maharajah Jam Sahib of Nawanagar, of which some of the dimensions were erroneously entered on page 664 of my previous paper. The skulls are measured in English inches, the teeth in millimetres.

History and Sex	Total length	Cond. bas. length	Zygom. width	Post-orb. width	Int-orb. width	Max width	Mandible length	Upper carnal	Lower carnal
Nawanagar ..... ad. ♂	13·4	12·3	8·9	2·3	2·9	3·8	9·4	37 × 18	25
,, ... ad. ♂	13·1	11·8	9·1	2·2	2·8	3·7	9·1	35 × 17	24
Junagadh ..... ad. ♂	13·1	11·8	8·8	2·1	2·8	3·6	9·0	36 × 18	25
,, ... ad. ♀	11·9	10·7	8·0	2·0	2·5	3·5	8·1	31 × 15	22

The incidence of the duplication of the intraorbital orifice in the skulls of the Indian lions in which it has been recorded is sufficiently interesting to recapitulate—

Orifice divided on both sides in 1 ♂, 2 ♀, 2 unsexed skulls.
Orifice divided on right side only in 4 ♂ skulls.
Orifice divided on left side only in 2 ♀ skulls.
Orifice undivided on both sides in 1 ♂, 1 ♀ skulls.

Thus in 13 skulls, 11 have the orifice divided on one or both sides; 2 only resemble African lions in having it undivided; but the data are not enough to justify the conclusion that, when the orifice is divided on one side only, the tendency is for the modification to affect the right side in ♂ skulls and the left side in ♀ skulls.

Zoological Department of the
British Museum (Nat. Hist.),
London.
June 12, 1935.

R. I. POCOCK, F.R.S.

III.—A SHORT-TAILED TIGER.

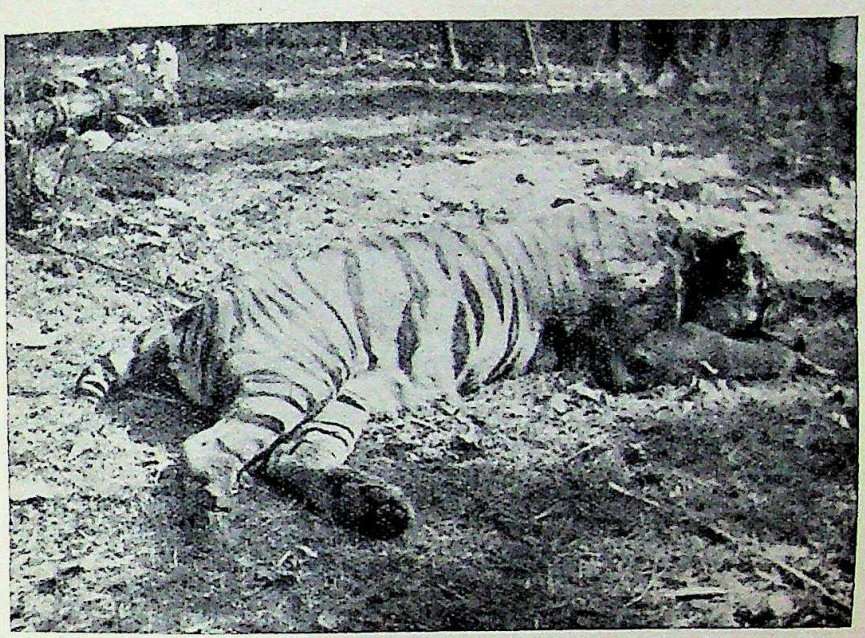
(*With a photo*).

The Minor Chief of Udaipur State, E.S.A., shot with me yesterday a tigress measuring about 9 ft. in length. It had a very short

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tail. On examination it was found that the tail might have been damaged during its infancy. The tigress was an old beast. It



A 'close up' of the tiger showing the short tail.

resembled greatly the tailless tiger shot by Mr. R. C. Morris, F.Z.S., on 1st May 1934, a photo of which appeared in the *Journal of the Bombay Natural History Society*, vol. xxxvii, No. 3, of 15th December 1934.

AMBIKAPUR,

SURGUJA STATE. MAHARAJA OF SURGUJA.

April 27, 1935.

[In a subsequent letter the Maharaja states that he is of the opinion that the shortness of the tail resulted from an old injury.—EDS.].

IV.—A CASE OF TIGER EATING SALT-LICK EARTH.

While Mr. C. McCann and I were collecting for the Vernay-Hopwood Chindwin Expedition in the evergreen forests at the eastern foot of the Naga hills in Upper Burma we came on a case of a large tiger frequenting a salt-lick and eating the earth, its droppings being full of it.

I think instances have been recorded of salt-lick earth being eaten by pregnant tigresses, but this was obviously a large male.

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There were very few tracks of game, which was possibly due to the fact that the tiger had been practically living at the salt-lick for some time, in fact the Kachins putting up a machan came on his fresh form.

HONNAMETTI ESTATE,
ATTIKAN P.O., *via* MYSORE,
S. INDIA. R. C. MORRIS.
April 20, 1935.

V.—TIGER FEEDING ON A LIVE COW.

In regard to Col. R. W. Burton's note in vol. xxxvii, No. 4, about a tiger feeding on a cow while yet alive, a case of this nature occurred at Bailur in the Kollegal Division of the Coimbatore District some years ago, a bait having been felled and partially eaten, by a full grown tiger, while yet alive.

HONNAMETTI ESTATE,
ATTIKAN P.O., *via* MYSORE,
S. INDIA. R. C. MORRIS.
July 12, 1935.

VI.—DISTRIBUTION OF THE HUNTING LEOPARD (*ACINONYX JUBATUS* ERXL.) IN SOUTH INDIA.

In Part III of 'The Wild Animals of the Indian Empire' (*Jour. Bom. Nat. Hist. Soc.*, vol. xxxvii, No. 4), dated 15th April 1935, it is mentioned that the Cheetah or Hunting Leopard is not known to have occurred in South India. This however is incorrect. The Cheetah or Hunting Leopard has been found in Mysore, and the late Mr. C. E. M. Russell shot a male measuring 5½ ft. in length in August 1882 in the Berrambadi Forest of the Mysore District. Mr. Russell was then Deputy Conservator of Forests in the Mysore Service. The animal he saw was one of a group of five he came upon. This incident is recorded in Mr. Russell's book *Bullet and Shot in Indian Forest Plain and Hill.*

Col. Pollock in his book *Sporting Days in Southern India* also records the occurrence of the Hunting Leopard in South India, and, I think, I am correct in saying that my father, the late Mr. R. H. Morris, saw one near Attikalpur in the Chamarajnagar State Forest, Mysore District; this must have been sometime between 1890 and 1895.

Further, although Sanderson never saw a Cheetah himself, he records having seen two skins of the species which were shot by native shikaris.

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Though this species was certainly unknown in Southern India Jerdon is quite correct in defining its distribution as 'throughout Central and part of Southern India, . . .'

HONNAMETTI ESTATE,
ATTIKAN P.O., *via* MYSORE,
S. INDIA. R. C. MORRIS.
July 8, 1935.

VII.—A FIGHT BETWEEN A CAT AND A VIPER.

A fortnight ago when I was putting up in a thatched building in a village near Palghat I witnessed the following incident which I hope will be of some interest to readers.

The night was pitch dark. It was about 11 o'clock and I and my friend had just gone to bed when something heavy fell from the roof near my cot. I was startled and at once got up and lit a candle. I saw a cat and to my surprise a large Russell's Viper (*Vipera russelli*) which was hissing at it. Both my friend and myself drew back and watched. A regular fight was going on between the cat and the snake on the very spot where they fell down, neither yielding an inch from its position. Whenever the snake struck at its opponent, the cat spread its claws and struck at the Viper's head right and left. For half an hour the contest continued and all the time the cat fought so fiercely and struck blow after blow so quickly that the reptile had no chance of biting the cat. By this time, blood was jetting out from the snake's snout, its eye-balls were torn out and at last it fell unconscious. In a short time it lay motionless and dead.

The cat never used its teeth in killing the snake nor did it eat it.

The next morning when we spoke of the strange incident to some of our local friends they told us that such quarrels between cats and snakes are common in these parts and that the cats never eat the snakes but only kill them. They account for such quarrels thus: the cat goes in search of rats. The snake also visits the houses in search of rats. Occasionally the cat meets with a snake. The cat either mistaking the other for a rat or thinking that it is a new kind of food jumps at the stranger and the fight begins.

MAHIM. T. V. SUBRAHMANYAM.
April 25, 1935.

[In vol. xxxiv, p. 256, we published a note on a fight between a cat and a cobra. The cat avoided the thrusts of the snake and struck in return before the snake could recover. The next morning the cobra was found dead with the head and neck torn to ribbons. Like mungooses, cats escape being bitten in encounters with snakes because of their extreme agility. Animals as a

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rule betray no instinctive dread of snakes—exceptions to the general rule are perhaps the monkeys and the higher apes. The suggestion that the cat mistook the snake for a rat is highly improbable.—EDS.].

VIII.—BANDICOOTS ATTACKING A COBRA.

From the 'Evening News', Bombay.

One day at about 11-30 p.m. I was talking with the members of my family when a servant came to me and informed me that a big cobra was near the kitchen window and that it was surrounded by five bandicoots.

I ran up to see the interesting encounter when to my great disappointment I found that some fifteen servants had assembled to watch the fight. One of them had a torch in his hand and they were making much noise discussing which would win. The light of the torch and the noise of the servants frightened the bandicoots who retired first followed by the cobra and I was unable to see the fight.

The servants related to me the following version, which is reliable, as all the servants who witnessed the fight corroborated what I am about to describe.

My cook, who was sleeping near the kitchen window, was aroused by a hissing noise outside. It was about 11-30 p.m., and full moon and the night was very clear.

The level of the ground is about five feet from the window. He peeped through the window and saw a big cobra coiled with its hood erect, surrounded by five bandicoots who were attacking it one after the other.

The most interesting part of it was that the bandicoots were attacking the snake alternately; when the cobra was being tackled by one in front, immediately two of the bandicoots ran at it from behind. They ran continually forwards and backwards, keeping at a safe distance and were very vigilant in retiring from the darts of the cobra.

I do not know who would have won the fight. So, any of your readers, who may have seen such a fight to the finish will oblige me by informing me through your paper.

BOMBAY. S. C. PETIT.

September 17, 1935.

IX.—BEHAVIOUR OF THE WILD DOG (*CUON DUKHUNENSIS* SYKES).

There have been many interesting letters to the journal describing the behaviour of the Red Dog. To what has been said I would

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like to add something from Burma, where the wild red dog is fairly common in certain localities.

The Shans, and I think the Burmese, believe that the red dog blinds its victim by squirting its urine into its eyes. This singular and acrobatic feat sounds ridiculous, but it is always worth while investigating native superstitions and beliefs about wild animals, and so I record it in case anyone would like to test it for himself. It would not be difficult to obtain some urine from a dead red dog, and put some of it into the eye of a goat, or other animal, and see whether it had any blinding effect or not. Is the belief held in India, I wonder?

I have heard that the red dog blinds its victim by biting out the eyes. I am satisfied that this is so myself, as the following account will show.

I was hunting Tsaine east of the Salween in Karenni, when about four o'clock in the afternoon, as I was making my way cautiously up a dry nala bed, I came suddenly on a small party of red dogs among the boulders of the chaung (stream). There were about five or six of them, and they just withdrew a short distance from out of my way, and waited. I shot one with a .318 rifle (solid bullet) through the shoulders, and it came tumbling down into the river bed. It was not dead, and the Shan hunter with me put the poor beast out of its agony by hitting it on the head with a big stone. Though in pain and anguish, the wild dog made no sound, nor did it attempt to bite the man.

To my surprise the other dogs did not clear off but waited in the vicinity without showing any fear. From time to time, I saw them moving slowly about among the bamboos. Then I noticed the reason for their presence there. They had just killed a large wild sow. The carcase was lying on its side in the chaung bed. It was still warm, and the only damage to it appeared to be that the belly had been ripped open and a few mouthfuls of meat eaten.

There were no jungle crows, kites, etc., about. One notices carefully the presence of such birds when big game hunting.

I was surprised to notice on examining the pig that the eye on the top side was missing. Knowing the belief held by the natives that wild dogs bite out the eyes of their quarry, I turned the body of the pig over to see if the eye on the other side, in contact with the ground, was missing. It was. Both eyes had been cleanly whipped out. The eyelids had not even been torn. There were no other wounds on the head. We took most of the meat, but according to custom left some for the killers and continued on our way.

The Shans have a firm belief that the Porcupine is hermaphrodite. I shot one to see if there was any reason for this astounding belief. There was—most certainly. I could not tell the sex of the one I had shot from an examination of the external genital organs. It appeared to be hermaphrodite!!

On careful dissection at home I found that the 'penis' had no duct, but that the female organ into which it fitted admirably was normal, and led to the ovaries. I recommend anyone who

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is curious about this to dissect the genitals of a porcupine for himself!

T. R. LIVESEY.

Taunggyi,
S. Shan States.
May 15, 1935.

[As regards the supposed 'hermaphroditism' in the Porcupine the belief probably arises from the fact that in porcupines, as in many rodents, the external genitals are not always in marked evidence. The penis of the porcupine (*Hystrix*) is habitually retracted out of view. It is bent backwards so that the prepuce forms a swelling a little beneath the anus. The testes undergo a periodical increase of size and change of position passing from the abdomen into a sessile scrotum and being retracted after the rut. The vasa deferentia or ducts which convey the seminal fluid take the form of fine tubes which might easily be overlooked by those unaccustomed to dissection.

That Wild Dogs sprinkle the bushes through which they drive animals with urine or jerk the urine into the victim's eyes with their tails and so blind them is a belief which is prevalent in many parts of India. In Burma they are supposed to destroy tigers and even elephants by this strategem. Hodgson and other naturalists have mentioned it in their writings, but as Blanford indicates, with the exception of Hodgson no one gives any credence to the story.

Blanford speaks of a similar belief in Europe in connection with wolves, though the strategy varies in this that the wolves dip their tails or their bodies in water and either shake themselves before a victim or work the water in its eyes and, before it can clear its vision, they take it in a combined rush. There is sometimes an underlying substratum of truth in legendary beliefs about animals, but it is quite impossible to indicate the basis of the present belief.—Eds.].

X.—RATELS AND CORPSES.

In Miscellaneous Note viii, at pages 952-3 of the *Journal*, vol. xxxvii, Mr. F. W. Champion invites readers to send in observations concerning ratels. In regard to the exhuming of corpses by this animal I am able to contribute the following:

In the year 1917, while in charge of a sub-division of the Central Provinces Government Railway Police, the body of an unidentified man was found on the railway track near Gondia. The local Sub-Inspector of Police and members of the inquest were of opinion that the deceased had been killed by a passing train. In accordance with custom the body was made over to sweepers for burial.

Some days later anonymous letters were received stating the identity of the dead man, and that he had been murdered. After

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certain verifications it was decided to have the body exhumed for medical examination. The writer, accompanied by an Indian magistrate, had the unsavoury duty of supervising proceedings. Enquiry showed that the burial had taken place in an area used for the interment of low-caste Hindus. This place was some distance from the town, and situated near a thick grove of trees on the bank of a deep 'nala'.

After the usual formalities to ensure the exhumation of the identical body, we arrived at the correct grave to find that it had already been disturbed. Rags and pieces of the skeleton were strewn about; there were two or three holes about a foot in diameter tunnelling into the grave; and it was perfectly clear that these had been made by some animal. The body had been thoroughly destroyed.

The sweepers, and a local Muhammadan constable who had accompanied me, said *Oode Masans* had done the exhuming. Not having heard the name *Oode Masan* before this, I became inquisitive and questioned several other persons standing around. The replies I received mystified me all the more, and it was decided, at the suggestion of the Muhammadan constable, to search the grove for the mysterious disturber of the dead.

The search resulted in two full grown ratels, with three half-grown youngsters, being dislodged from the hollow trunk of a dead tree. These escaped into the undergrowth and were not seen again.

I have no direct evidence that the ratels were responsible for this, and other exhumings indicated by the condition of several graves in the vicinity; but it is well known how negligent the poorer members of the low-caste Hindu community are in regard to the burial of their dead, such being frequently unearthed by hyænas, jackals, and other prowling scavengers. All the natives present were unanimous that ratels were the culprits.

The circumstantial evidence in this particular instance supports what Dunbar Brander has said about the ratel. I have on several occasions seen ratels at night in the beam from the head lights of a motor car; and on one occasion stopped a car within four feet of one of these curious little animals while he was having a dust bath in the middle of the road. This was some miles from Balaghat.

THE LODGE,
COONOOR.
June 3, 1935.

L. E. CLIFFORD HURST,
Indian Police.

XI.—SLOTH BEAR (*MELURSUS URSINUS* SHAW) ATTACKING A LIVE BAIT.

I am writing to inform you of a somewhat curious happening I met with a month ago. I generally tie up goats on a platform about 4 to 5 feet high in order to make no mistake against a bait

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being killed by a hyæna. I was sitting over a bait tied up in this way when a bear came out and killed the bait on the platform. The light being somewhat poor I could not at first clearly make out what it was. This happened about 8-30 p.m. and the sky was cloudy. When the moon came out of the clouds and shone on the surroundings I was surprised to see a bear on the platform. I shot the bear then. On examining the kill closely I saw that the bear had bitten the goat near the nape of the neck. It had eaten very little, but the whole skin on one side of the goat was completely torn off with tattered bits left here and there. In Kashmir, bears do kill bullocks and calves but a sloth bear acting in this way seems somewhat curious. The bear killed was a male measuring 4 ft. 10½ in. between uprights.

AMBIKAPUR,
SURGUJA STATE. MAHARAJA OF SURGUJA.

April 25, 1935.

[In the *Journal* (vol. x, p. 690) there is a note by Reginald Gilbert who writes of a sloth bear attacking a buffalo tied up as bait for tiger.—EDS.].

XII. AGE OF PUBERTY IN THE INDIAN ELEPHANT (*ELEPHAS MAXIMUS* L.).

With reference to the note on page 960 of volume xxxvii concerning the time of sexual maturity of the elephant, it may be of interest to record the details of the elephant 'Wästl' born in captivity at the Münchener Tier Park on the 8th. May, 1932. The father, 'Boy', was nine years old and the mother 'Cora' eight years old. The elephant was conceived at the end of August 1930 and the period of pregnancy was only 20 months and 7 days; the accepted time of pregnancy of elephants is between 22 and 24 months. There is reason to suppose that the birth in this case was premature as the baby could not reach its mother's teats when it was first born, and even when he was fed from the mother in a lying position the milk was unsatisfactory and for the first twelve days he was fed by bottle. The milk from the mother was a thin and watery fluid containing only 4 per cent of fat instead of the normal 22 per cent. The baby at birth weighed only one hundredweight instead of the usual two hundredweight. These particulars are taken from the June 1932 number of the magazine *Das Tier und Wir*, published monthly by the Munich Zoo which contains a series of extremely attractive photographs of the baby and its parents.

THE DOON SCHOOL, CHAND BAGH,
DEHRA DUN. A. E. FOOT.

June 9, 1935.

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XIII.—SOCIAL BEHAVIOUR OF BISON (*BIBOS GAURUS* H. SM.).

Mr. J. William's note on the Social Behaviour of Bison in vol. xxxvii, No. 3, is interesting in that it supports my previously recorded views regarding the mastership over herds during the breeding season frequently enjoyed by solitary bull bison; in other words, in my opinion both in the case of bison and elephant many bulls lead a solitary existence voluntarily and have not necessarily been turned out by younger bulls. I have observed 'solitaries' join and assume mastership of a herd during the breeding season late in the afternoon leaving the herd again soon after daylight.

In regard to dewlaps, bison without dewlaps and with varying degrees of dewlaps are to be found in any district in South India where bison occur in numbers.

HONNAMETTI ESTATE,
ATTIKAN P.O., *via* MYSORE, R. C. MORRIS.
S. INDIA.

July 12, 1935.

XIV.—THE 'WHITE' BISON (*BIBOS GAURUS* H. SM.) OF SOUTH COIMBATORE.

(*With a photo*).

I have read Mr. Dunbar Brander's note on the above in your *Journal* of the 15th July 1935. I do not agree with Mr. Dunbar Brander that my description 'sandy or light fawn' is identical with 'dormouse coloured', but this is a matter of opinion. Mr. C. C. Wilson's description of the 'White' bison of South Coimbatore as 'very light cream', is really a more correct definition of their colour.

Mr. Dunbar Brander claims to have had equal experience of bison as Mr. Wilson, but this statement is at variance with his book 'Wild Animals of Central India' in which he admits not having had much experience of bison. However, it is obviously futile to continue this argument. Mr. Dunbar Brander has not seen the South Coimbatore 'white' bison, and, therefore cannot possibly tell how they compare with the bison he claims to have seen in the Central Provinces.

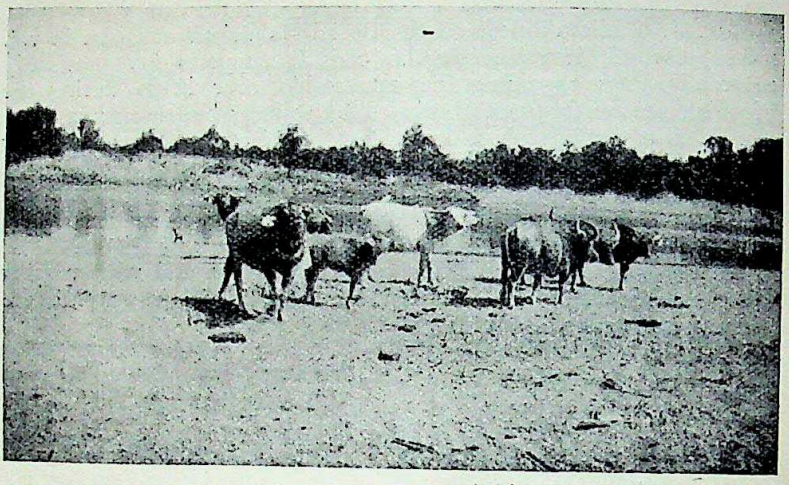
It would be interesting to learn the area in the C. P. the light coloured bison are to be found in, if they still occur, or whether they have been seen lately. It is certainly remarkable that their existence has never been recorded by previous authors or the Bombay Natural History Society.

I have not yet been able to take photographs of the South Coimbatore 'white' bison, but I had an opportunity while in Upper Burma recently of taking photos of similar abnormal colouration in the case of semi-domestic buffalo on the banks of the Chindwin,

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The colour of these 'white' buffalo is identical with that of the 'white' bison in South Coimbatore, and the enclosed photo will



A herd of semi-domesticated buffalo on the Chindwin River.

show how they compare with normal coloured buffalo: and the comparison is very similar in the case of the bison.

HONNAMETTI ESTATE,
ATTIKAN P.O., *via* MYSORE,
S. INDIA.
May 14, 1935.

R. C. MORRIS.

XV.—LENGTH OF HORNS IN TSINE (*BIBOS BANTENG BIRMANICUS* LYD.).

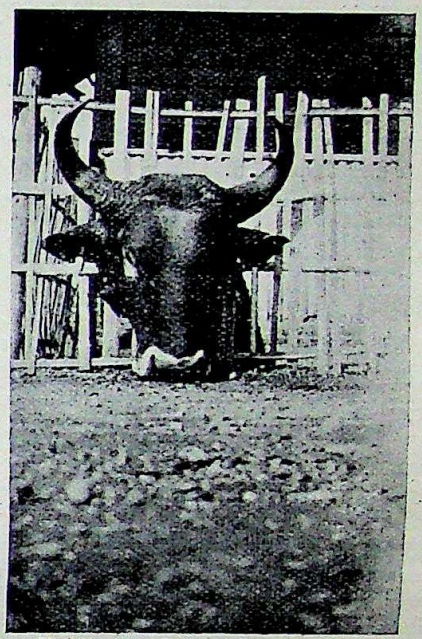
It would please me much, if you could give me some information on a few things I wish to know regarding Tsine (*Bibos banteng birmanicus*).

A few days ago, a friend and I went out after these animals in the Katha District. The jungle was in perfect condition for tracking, rain having fallen heavily in those parts. I returned to our camp empty handed, but heard two reports of my pal's rifle. He returned with the news that he came upon a pair of old bulls, and wounded one rather badly, the other one escaping intact. He was rather timid to follow the blood trail, as tsine are somewhat vicious when wounded. I followed up the next morning from where my friend left off, and tracked it till about 4 p.m. without catching sight of it. I went after it again next morning, but could not find fresh tracks, as rain had fallen and obliterated them. I was rather annoyed, and kept moving about in circles, hoping to find tracks made after the rain had stopped. I eventually came

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on a spot where an animal had rested, and found tracks at the most about one hour old. I hung on to them, and was rewarded by seeing a massive brute about twenty paces away. My .404 rifle did the rest, and I was quite surprised to find that the animal was not the one wounded by my pal. There were only two wounds, and these were caused by my rifle. I am inclined to think that after one animal had been shot at and left, the other made off and met him later. The Burman who accompanied me agreed that such was the case, and that the one I had killed had abandoned his wounded companion. A word now about my animal.



Head of a Tsine (*Bibos banteng birmanicus*).

Colour: Almost totally dull black with dark brown towards the stomach. Buttocks dull white, also the stockings.

Length along curves: Tip of nose to root of tail 8 ft. 6 in.
Length of tail without hair: 3 ft. 1 in.
Height: 6 ft. 2 in.
Weight: I should say about 350 to 400 viss.[1] The pelt alone weighed 35 viss.
Horns: Very poor for such a huge beast. Corrugations very pronounced.

The measurements taken are as follows:

	Left.	*Right.*
Length	20½ in.	20 in.
Girth	18 ,,	17¾ ,,
Corrugations	6 ,,	6½ ,,

Other measurements are:—

Widest outside	28½ in.
Widest inside	23½ in.
Sweep (across forehead)	53 in.
Tip to tip	21 in.

Colour: Black at corrugations. A sort of biscuit shade in the middle, black tips.

[1] 1 Viss = about 3½ lbs.—Eds.

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Can you assign any reasons for such small horns in an old animal? The country is hilly, grass, fruits, and water plentiful, and on the whole I do not think more ideal conditions prevail in other districts. I have seen better heads on young bulls, and shall be thankful to have your views on the subject.

SAGAING, BURMA. D. A. DE LASTIC.

June 18, 1935.

XVI.—HABITS OF THE HOG DEER (*HYELAPHUS PORCINUS* ZIMM.).

I notice that in your recent publication *The Wild Animals of the Indian Empire* reprinted from the Society's *Journal*, vol. xxxvii, No. 1, the following remarks are made concerning *Hyelaphus porcinus*, the Hog Deer. 'Hog Deer are generally solitary creatures . . . sometimes small parties of 2-5 may be seen grazing together.' And this in my experience is usually the case in Assam. I thought therefore in view of the above that you might be interested to hear of a recent experience of mine in the Kuziranga Game Sanctuary of this province (Assam). While out on elephants one morning looking for Rhino, of which we saw thirteen, including a young one, during the few days spent in the Sanctuary, we came across a herd of over eighteen Hog Deer feeding together in a small 'doloni' (swamp). They consisted of one fine stag with a very good head, several young stags, and the rest hinds, some with young. They were all feeding together and we were able to watch them for some time from the elephants. Finally they moved off into the Ekra jungle surrounding the doloni and we slowly made our way through the herd. The whole thing certainly looked like being a family gathering and not merely a number of animals that had collected in the same place by chance on account of the good grazing to be found there.

It would be interesting to know whether there are any other records of such a large number of this species being seen together.

NOWGONG, ASSAM. J. B. ROWNTREE, I.F.S.

June 18, 1935.

XVII.—DISTRIBUTION OF CHITAL (*AXIS AXIS* ERXL.) IN ASSAM.

In the article *The Wild Animals of the Indian Empire*, under the Chital or Spotted deer at page 75, Part II, it is mentioned that Chital are unknown in Assam.

This is not correct. I have got several herds of them in my Division, District Goalpara of Assam and I believe it occurs even further east. I hope you will make enquiry about this from our

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Conservator of Forests, Shillong, who has a vast knowledge about wild life in Assam.

DHUBRI, ASSAM. R. N. DE, I.F.S.
May 10, 1935.

[In reply to our letter, Mr. A. J. W. Milroy, Conservator of Forests, Assam, wrote as follows:—

'With reference to your letter dated the 13th May 1935, I can inform you that the spotted deer is found north of the Brahmaputra in small herds apparently isolated from each other in north Kamrup and Darrang as far east as the Dhansiri river, beyond which it has not been recorded. Its occurrence south of the Brahmaputra is unknown.'—EDS.].

XVIII.—THE STATUS OF THE BROWN SHRIKE [*LANIUS C. CRISTATUS* (LINN.)] IN THE S. S. STATES, BURMA.

In the S. Shan States the Brown Shrike is a fairly common bird in the winter, and I have noticed odd single birds about as late as June, which would suggest that a few non-breeding birds remain in the Shan States throughout the summer.

All the birds I have noticed hitherto were in the sombre pale, barred plumage, but this year in May, I noticed here some in full breeding plumage, with the conspicuous and heavy black line through the eye.

This full plumage was unknown to me as I have never been in the breeding area of this shrike. It is as unlike the usual cold weather barred plumage as to suggest another species.

I should be interested to know whether the Society has skins of this Shrike in the full, clear and unbarred plumage that have been taken in the cold weather in India and Burma, as I am inclined to believe that this Shrike has *two distinct phases of plumage*—the pale brown, barred plumage, with the brown line through the eye, in the winter; and the full clear breeding plumage, not barred, with the black line through the eye, in the summer.

It is most unlikely that all the birds I have seen in the cold season have been in immature plumage—and not a single one in full plumage.

As I have never observed any but single birds in the summer here, I conclude that the brown shrike does not breed in this part of Burma.

TAUNGGYI. T. R. LIVESEY.
May 15, 1935.

[It would be useful if Mr. Livesey collected specimens of the two colour phases to which he refers. As known at present, the Brown Shrike is not dimorphic, either seasonally or sexually. First winter birds differ from the adult in having the band through the eye brown instead of black, but occasionally the brown band is retained in the adult. The crescentic barring on the lower plumage

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is much greater in amount in first winter birds, but also persists in most adults in a more or less obsolete form.

As far as we are aware, there are no records of this Shrike breeding within Indian limits south of the North Cachar Hills.—Eds.].

XIX.—HABITS OF THE BURMESE STONE CHAT (*SAXICOLA CAPRATA BURMANICA* STUART BAKER).

The Burmese Stone Chat is the common little black and white chat of the uplands of the Shan States, and especially numerous between 3,000 ft. and 6,000 ft. He is a typically perky little fellow, with the characteristic short tail of the stone chats. The cock bird is black with glistening white wing patches, and white upper and lower tail-coverts. The hen is a quiet little reddish brown bird with a paler patch on the upper tail-coverts. The cock when perched may, or may not, show the white wing patches. That depends on how he chooses to hold his wings. These white wing patches of his are his conceit, to be shown off to advantage during his little love-flights round the hen, or during his display from the top of a twig.

They are cheerful birds that take kindly to the presence of human beings, for they love the open cultivated lands where they feed and breed. They are possibly on the increase with the extending of field lands.

The cock has a pleasant and trilling little song, full of tenderness and passion, which he indulges in at intervals all through the day. He starts before dawn, and I have heard him give a few, low but enthusiastic notes during the night when there was a moon. He likes to give his song during a love-flight over the area he has chosen as his very own for the nesting season. Then he shoots up into the sky, and then round and round in great wide dips for such a tiny bird. Short but sweet—

'And when his song is done at last . . .
My heart beats just as fast!'

And hers too no doubt.

There are two hill tribes in the Shan States, among others, to whom the engaging little ways of this bird are well known. They regard these little chats that share their cultivation with them with interest and affection. They know too that they are the commonest fosterers of the cuckoo (*Cuculus c. bakeri*). These two tribes are the Taungyo and the Taung-thu. To the former this chat is known as '*Paul-ling-nget*', with the accent on the 'ling' —and to the latter as '*Laung-tha*'.

In Burma they extend as far south as Karenni, parts of which are bare and dry country.

It is as a fosterer of the cuckoo that I have been especially interested in this chat. It is surprising, if one specializes in finding the nests of a given species, how expert one becomes after a few years. I can now always find the nest of any pair of chats, when they have one. I admit that it sometimes needs persistence,

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and some patience with the field glasses, especially if the nest contains but one or two eggs, or has not yet been laid in.

In the Shan States this chat is by far the commonest fosterer of the cuckoo—I should say at least six times as favoured as any other species. Although the cuckoo's eggs adapted to this chat agree pretty well in general colour and markings, they never show the delicate greenish blue ground colour of the chat's eggs. The cuckoo's egg is nearly twice the size of the chat's, but I have noticed no desertions. They seem to take very kindly to being imposed upon by the cuckoo, and after much observation, I am inclined to think that, far from resenting the cuckoo's attentions, they even seek to attract the cuckoo!

These chats pair off and take up their areas for nesting early in March. Perhaps they are paired throughout the year, but I think not. Eggs are laid in March, but April is the main laying month, and thence on to the break of the monsoon about the middle of May. The heavy rains flood out and destroy most of the nests of those that try to bring up a brood later on.

Having settled on their respective areas after a good deal of fighting and song contests, the cock birds mount guard over their estate and can be seen a long way off sitting on some prominent twig top, or on a bamboo fence or some such point of vantage from which to 'see off' all rivals of the same kind. An ordinary sized field will hold a single pair of chats but a large field may have two or more pairs nesting in it. Much depends on the lie of the land. Out of sight in such cases is often out of mind. The chat is quite friendly disposed to visiting bulbuls and other birds; what he cannot tolerate is a raid from another chat. The only other bird that seems to excite him, and his wife, is the cuckoo. They are greatly excited at the visit of a cuckoo. They fly up at once to meet the cuckoo and sit by it, and flutter round from time to time. Then very often the hen chat will fly off straight to her nest, and so give it away, so it seems to me, to the cuckoo! . . . And yet it is all very puzzling for on occasions the cuckoo will descend on the chat's nest and eat one of the eggs![1] But perhaps they are willing to run the risk of the loss of their eggs for the favour of a wonderfully large baby!

They are exceedingly cunning in secreting their nests; and in preserving the secret when once the nest has been made. The cock bird mounts his faithful guard and at once gives warning to his mate if anyone is about. As you step into the field the hen bird sneaks off her eggs, even when they are hard set, and her dull brown plumage and low flight over the brown earth defeats the eye. If she, or he, have been surprised, then she may sit tight on her eggs and only fly up at your feet. But that is quite exceptional—a bad blunder! As a rule to find the nest it is best to retreat to a considerable distance, to the next field, and watch with field glasses for the hen bird to return to her nest. Then the exact spot must be carefully marked.

The favourite nesting site is out in a ploughed field under a

[1] Is this to test the state of incubation?

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clod of earth, but any broken ground may serve the purpose. After a bit one gets to know exactly the kind of place where the nest is likely to be. Another favourite place is in a stubble field where there are clods of earth lying about. Other sites are on open waste lands, and on hill sides and in gardens, but never within forest. If in light scrub, then always near an open space in it. Often the nest is placed under a rock, but again nearly always in the open, or at the foot of a bush or tuft of grass, but not within the cover, on the outskirts of it. Sometimes they nest in the hollow of a section of bamboo lying out on open ground, and I have taken a cuckoo's egg from such a nest which no cuckoo could of course possibly get its body into. Under an old tin too is often a favourite place, and I have found a nest inside an old kettle. Then banks are freely made use of, and broken nalas, the nests being placed in some hole in the side of the bank. Such nests are the most obvious of all. But here again on open ground, and not in banks along forest paths as chosen by the Dark Grey Bush Chat. Sometimes the nest may be cleverly hidden in a deep hole in the ground and only yield to discovery after a prolonged exploration.

In such narrow little places, under clods of earth and in crevices, the eggs are often quite out of sight as one peers in, but the edge of the nest is nearly always to be seen. Those under clods can only be examined by getting the eye down to ground level. Rarely is it possible to get an egg out, even with two fingers, without damaging the nest and causing a fall of earth into it. In such narrow places the egg of the cuckoo is found, and how exactly the cuckoo gets it in there still remains a mystery. I have often found, I did yesterday, a cuckoo's egg lying on the edge of the nest some four inches away from the chat's eggs. Whether the chat in such cases has 'footballed' the cuckoo's egg out, or whether the cuckoo has laid or deposited it there outside, is a mystery also.

The full clutch of eggs is five; but six are sometimes laid. Often four only are incubated. They are handsome and well marked, pale greenish-blue with rusty red spots and markings which are heaviest at the larger end where they generally form a cap, or zone. A pale egg is often found in a clutch. The eggs vary much in size in different clutches. Cuckoo's eggs never seem to be so definitely marked as the chat's; they are distinctly paler, and, as I have said, never seem to show the greenish ground colour. Their red markings are lighter in tone than those of the chat's eggs.

Pale blue, immaculate eggs laid by cuckoos adapted to the Dark Grey Bush Chat are frequently found in nests of the Stone Chat. In such cases the contrast is quite startling, but I have noticed no desertions on that account. These are probably placed in Stone Chat's nests *faute de mieux* as the Dark Grey Bush Chat is getting scarcer every year round villages and towns owing to the ruthless destruction of trees and vegetation that goes on.

When a chat has eggs the cock bird will follow all your movements, while the hen will hide discreetly away until the danger

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has passed. If they have young ones both cock and hen will be very agitated and keep up a continual calling of their anxiety as they wait upon the intruder.

When a brood has been successfully reared, the whole party keeps together for some time, ten days or more, after which I suspect the old birds to have a second brood, or an attempt at it if the monsoon does not intervene.

No one can paint such an accurate and charming picture of a bird in a short sentence as Mr. Stuart Baker can, and his description of this chat's feeding '. . . catching insects on the ground by making little sallies from some point of vantage', is perfect. They never stay more than a few moments on the ground though, but soon fly up again on to a twig, or grass stem, so as to be able to look round. This helps one to find the nest, as if a bird goes to ground for any considerable time it has probably gone to its nest.

The cock chat is an admirable little husband and helps to build the nest, and is given to scratching out nesting cavities on his own sometimes. He does not, however, ever incubate the eggs but keeps to his job of mounting guard over the nest so as to warn his wife of any danger.

Both sexes carefully tend the young, and bring them food every few minutes.

I suspect there is a slight up and down migration of this chat, and that they come up to the high lands to breed and go a bit lower and explore afield during the cold season. They are to be seen out in the reeds on the Inlè Lake in the cold weather though not far from the banks.

In conclusion, mention may be made of the other kinds of birds that nest about the same time as the Stone Chat, and in somewhat similar places, under clods out in the open fields. These are the Skylark (? Chinese race, but at lower elevations, 2,000 ft. to about 3,200 ft.), the Crested Bunting, and the Indian Meadow Pipit. Cuckoos are parasitic on them all to some extent.

TAUNGGYI,
S. SHAN STATES, T. R. LIVESEY.
BURMA.
May 1, 1935.

XX.—CUCKOOS IN THE S. SHAN STATES.

The cuckoos are back, but in the vicinity of Taunggyi (4,700 ft.) I did not see them till 28th March, which is late. Usually they are here, and begin to call, about the 15th. I have heard them as early as the 9th.

I have never heard of a satisfactory explanation for the apparently hawk-like appearance of the cuckoo. Perhaps it is only hawk-like to our eyes. It does not seem to frighten birds at all, though it excites them. Then, if it is really true that the cuckoo (*Cuculus canorus bakeri*) mimics the hawk, what hawk does the little Plaintive Cuckoo mimic? There is no minute sparrow-hawk.

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I think there must be some other explanation. Frequently a cuckoo will perch on some lofty bough, the top of a bamboo for instance, and he will be joined by a Stone Chat. The Chat seems to gaze in rapture at the cuckoo only a couple of yards off. The expression on the Chat's face appears to be one of rapture, not fear. He is very interested. The cuckoo too stares in a stupid fowl-like way. So they sit like this for a considerable time.

What passes in their minds?

It is possible that the Chat has been the foster parent of one, or more, cuckoos in past years.

If the Chat resented the cuckoo, he would not seek to sit by him. And surely they would refuse to bring up a young cuckoo when they recognised it as a parasite.

Perhaps the chat regards the cuckoo with admiration, and seeks to attract him.

The male cuckoo, I believe, sits on some prominent bough at the top of a tree for the same reason that the hen does, to watch the terrain round about for signs of a chat's nest. I have seen a male cuckoo fly down to a chat's nest that contained eggs, and then pass on. He did not do so to eat the eggs, for he did not disturb them. It would appear that he did so to see if the nest and eggs were in a suitable condition for the deposit of the female cuckoo's egg. And that he would show her the nest, if suitable, later on, thereby gaining her favour.

From signs I have seen here, the cuckoo lays her egg very late in the day, at almost sunset time, which makes observation very difficult in the failing light.

There are many cuckoos here that lay a pale blue, immaculate egg, which appears to be adapted to the Dark Grey Bush Chat (that lays unmarked eggs in Burma). These eggs are most usually found, as one might expect, in the nests of that bird; but as the Bush Chat has become scarce now in the vicinity of Taunggyi, owing to the general destruction of trees and bush lands, these cuckoos laying the blue, unmarked eggs, have to find some other species to receive them. So it is that these blue eggs are frequently found now in the nests of the Stone Chat. Then the contrast is most marked, though I have not noticed any desertions on that account.

I have seen only one cuckoo's egg that was pale blue with a few, sparse red markings on it. This one egg struck me at the time as being the effort of a hen cuckoo hitherto laying a pale blue, unmarked egg, adapted to the Bush Chat, now trying to adapt herself to lay an egg suitable for deposit in the nest of the much commoner Stone Chat. It is an interesting suggestion. Surely *Desire* plays a very important part in evolution, though it is hardly ever referred to by Biologists. It cannot be measured! In the human race the *Desire* of the race brings about the particular type of beauty of the women (and men) of that race. If not, how can we explain the persistence of the 'almond', Mongolian eye in the people that have lived countless ages in hot tranquil lands, far removed from the windswept heights of central Asia? It was admired, and so retained, if not further emphasised.

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It is interesting to record that a Koël was here, and calling, for many days this year. It came up as far as my house which is about three hundred feet higher than Taunggyi. That would make it about 5,000 ft. above sea level, a height I have not heard of a Koël attaining to before. It soon left as there was no house crows to victimise.

Since writing the above a female cuckoo came and sat on a small tree 150 yds. in front of my house. She was at once joined by a cock chat who sat within 4 ft. of her, and above her, for about ten minutes. The chat was quite happy near the cuckoo, and ruffling out his plumage from time to time. The cuckoo stared stupidly. Then the hen chat joined them for a few moments and then she *flew straight to her nest about* 20 *yards* from the tree.

It is my opinion that the chats deliberately *show their nest* to the cuckoo and court the cuckoo's attention, and wish it to deposit its egg in their nest.

TAUNGGYI,
S. SHAN STATES,
BURMA.
May 1, 1935.

T. R. LIVESEY.

XXI.—SPEED OF THE GOLDEN ORIOLE (*ORIOLUS O. KUNDOO* SYKES).

Some time back, while motoring, I had an opportunity to observe the speed of this beautiful bird on wing. The road passed through a dense jungle of mango trees. A pair of Golden Orioles was flying from tree to tree and kept parallel to the road for about a couple of hundred yards. The speed of the birds was about 25 miles per hour.

NAVO VAS, DANA PITH,
AHMEDABAD.
April 21, 1935.

H. N. ACHARYA,
F.Z.S., F.R.G.S.

XXII.—ON THE OCCURRENCE OF THE IBIS-BILL (*IBIDORHYNCHA STRUTHERSII* GOULD) IN UPPER BURMA.

In a recent issue of the *Ibis* (April 1935) I recorded having seen a party of Ibis-bills on the Hpunchanhka, a stream in the Myitkyina district, about 150 miles north of Myitkyina, in December 1932. I unfortunately failed to obtain one, and so did Capt. W. M. F. Gamble who saw them in the same place a fortnight later. The occurrence of this species in Burma appears now to be beyond doubt by the accompanying skin of an adult bird shot by Mr. A. K. Thompson, Burma Frontier Service, at La-awn-ga in the Sumprabum Sub-division in December 1934, out of a flock of about twenty-five on the big shingle banks in the bed of the N'Tsi or Machi river, which here forms the southern boundary of the

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Putao subdivision. I have little doubt that this bird will be proved to occur annually in winter on the streams in the northern part of the Myitkyina district, as it does in Assam, at a low altitude, though I searched for them recently without success in late March at both the above places.

MYITKYINA.
March 21, 1935.

J. K. STANFORD,
Indian Civil Service.

[The bird skin sent is that of the Ibis-bill (*Ibidorhyncha struthersii* Gould).—EDS.].

XXIII.—OCCURRENCE OF THE FLAMINGO (*PHOENICOPTERUS RUBER ANTIQUORUM* TEMM.) IN NORTH GUJARAT.

On 17th. April, I saw about forty flamingoes flying over the Chandola Lake, two miles south of this city. The birds were on the wing for the whole day and went away west as soon as it was night. This is the first time during recent years that they have been observed in this area, though I am told they were occasionally found in pre-war days. There are numerous lakes in this part of Gujerat, which are full of water all the year round; but so far as I know, flamingoes are not known to visit them. The nearest haunt of these birds is the Nul Lake, some 40 miles south-west of Ahmedabad, and I think the birds I saw may be a batch from that place on the return journey accidentally passing this place, which may be out of their regular route. They appeared to be conscious of the strangeness of their surroundings, as in spite of their attempt to settle somewhere on the banks, they seemed to be unable to make up their mind. It was a wonderful sight to see these beautiful birds flying round and round over the vast expanse of the water, sometimes in a group, sometimes in single file. They occasionally came so low that their feet were actually skimming the surface of the lake.

NAVO VAS, DANA PITH,
AHMEDABAD.
April 21, 1935.

H. N. ACHARYA,
F.Z.S., F.R.G.S.

XXIV.—SOME RARE BIRDS IN NORTHERN BURMA.

These notes are from the Myitkyina district of Burma and confirm scattered observations already made in the *Ibis* in January and April 1935.

Crypsirhina cucullata. Hooded Racket-tailed Magpie.

I recorded having seen a single bird on January 25, 1934, at Mogaung, where the rainfall is at least 90 in. It is usually considered to be a dry zone species, and I imagined this bird must have been a vagrant. On April 24 1935, however, Mr. J. M. Shapland and myself had a close view of a pair about six miles from Mogaung at Myothit in the Namti valley.

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Further observation is clearly needed as to this bird's status outside the dry zone.

Suthora brunnea brunnea. Anderson's Suthora.

Already recorded in the *Ibis* from the Myitkyina-Yunnan border at Kambaiti. In May 1935 it was common from 5,000-7,000 ft., usually in pairs, though I saw one family party on May 24th; they were feeding in reedy grass or bramble bushes on open hillsides, and were not at all shy. The chestnut head and vinous-pink breast of the adults were most conspicuous.

Sitta himalayensis. White-tailed Nuthatch.

I obtained a single bird and saw a family party at Kambaiti (6,800 ft.) in late May 1935.

Dryonastes nuchalis. Ogle's Laughing-Thrush.

This bird seems to be not uncommon from the plains up to 3,000 ft. in the dense growth following cultivation. It occurs near Myitkyina and on both sides of the Malihka up to Putao. I have seen it with *Garrulax gularis*, *Garrulax pectoralis* and *Dryonastes ruficollis*. It is a great skulker and hard to get a view of, but has rich and distinctive notes, and if seen, the black throat, white cheeks and dark slate-gray head are most distinctive.

Garrulax gularis McClelland's Laughing-Thrush.

I had one sent me by Mr. C. C. Fisher from the Putao subdivision in January 1935 and saw three others at close range on April 2nd 1935 with *Dryonastes nuchalis* at La-awn-ga on the Putao-Sumprabum border, in wild plantains. A very shy bird.

Fulvetta manipurensis. Manipur Fulvetta.

This bird is only known from Godwin-Austen's Manipur specimens, and five obtained near Kambaiti in August 1933 and April 1934 (*Ibis*, January 1935). I shot two more on December 29th 1934 between 7,000 ft. and 8,000 ft. near Lungrebum on the Myitkyina-Bhamo border, one of which was in sparse cane jungle on an open hillside, and the other with *Alcippe*, *Zosterops* and *Stachyris ruficeps* in evergreen tree forest. They look very like Tits and are smaller than *Alcippe*, which they closely resemble, except for the more rufous colour of the back.

The Yawyin name is 'Shu-di'.

[Iris in one pale pinkish-yellow, in one straw yellow; bill black; yellow at gape; legs and feet livid brown.]

Lioparus chrysotis forresti. Yunnan Golden-breasted Fulvetta.

I shot a male, which, I think, was breeding, at 7,000 ft. in cane and damp tree jungle on the Kambaiti Pass road in May 1935. It was not at all shy and kept returning to one place, but I could not find a nest. The only other authentic Burmese records are from this area.

Delichon urbica subsp.? House Martin.

I obtained three identified as *whiteleyi* in 1934. On January 19, 1935, I saw seven or eight *urbica* hawking low over bamboo

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jungle near Hwehka in the Jade Mines but had no gun with me at the time.

Collocalia fuciphaga subsp.? Himalayan Swiftlet.

In three successive years these birds have appeared round Myitkyina in February and have not been observable at any other time. All these visitations coincided with local heavy rain and unsettled weather and probably they were driven down from the hills. The dates were:

1933. February 10-13.
1934. February 17-26.
1935. February 18-22.

In the 1934 visitation I obtained both *brevirostris* and *pellos*, flighting low over my garden. In late March 1935 I also saw a number in very cold, rainy weather feeding low over Fort Hertz.

MYITKYINA.
June 9, 1935.

J. K. STANFORD.
Indian Civil Service.

XXV.—NOTES ON SOME BIRDS OBSERVED BETWEEN YATUNG AND GYANTSE, TIBET.

Casarca ferruginea. The Ruddy Sheldrake.

These birds were observed in large numbers between Dochen Lake 14,600 ft. and Gyantse 13,100 ft. down the rivers. Several flights of up to 12 birds were seen but most of them were in pairs, some with broods of from 5 to 8 ducklings. On a Marsh about 5 miles from Kala 14,200 ft. after a bursting chase of 200 ft. I was able to catch one youngster out of a family of 5. It was still covered with down. Except for the pairs with broods these duck were exceedingly tame, and, mounted, I was able to approach to within 15 ft. of them without their taking fright. At Kala in the evening they were all in the fields of young crops.

Mergus merganser orientalis. The Eastern Goosander.

On 15th June after climbing up a hill to about 15,000 ft. from Tuna I surprised a pair of these birds which had been sitting amongst some bare rocks. They circled round quite close to me two or three times giving vent to their peculiar cry and then flew off rapidly towards a marsh some 400 ft. below. I saw another single bird 2 days later winging its way rapidly up the Tumbayung River.

Anser indicus. The Bar-headed Goose.

On 16th June near some warm springs about 3 miles north of Tuna 18 of these birds were congregated on the bank of a large pool. I was able to approach to within about 120 ft. of them before they took fright. They then flew up and circled round for

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about 5 minutes before finally retiring in the direction of Dochen Lake. Being short of meat I fired with my .355 Mannlicher into the head of the phalanx and by some miracle hit one through the neck. I saw no sign of any nesting here as they do on Rhamtso Lake.

Grus nigricollis. The Black-necked Crane.

Two pairs of these beautiful birds were seen. They have a similar cry to that of the Sarus Crane. I did not have an opportunity to study them for any length of time. Neither pair appeared to have any brood, though I was told that one pair had a nest in Dochen Lake somewhere.

Gypaëtus barbatus grandis. The Lämmergeyer.

Several of these magnificent vultures were seen cruising around, one over the Phari Plain about 15,000 ft., another in the gorges near Samoda, while a third I noticed sitting on the ground in the Kala Plain. I approached this latter one, mounted, as it seemed to be engaged in a meal, when I got within 150 ft. it flew off. Its meal had consisted of the very dried skinny remains of a Tibetan monk or pilgrim who had evidently died of starvation or exposure some 6 weeks previously. Except for some parched skin and hair in one or two places there remained only the skull and skeleton, not much of a meal even for a kite or hawk far less for a Lämmergeyer!

Columba leuconota gradaria. The Tibetan Snow-Pigeon.

Several of these birds flew down on to the track in front of us from the cliffs between Gautsa and Phari at a height of about 13,600 ft. They were exceedingly tame and seemed to realise that the presence of some ponies on the track meant fresh food for themselves. These birds are very pretty to watch in flight.

Columba rupestris turkestanica. The Blue Hill-Pigeon.

Round most of the villages through which we passed between 13,000 ft. and 15,000 ft. these birds were as common as the blue-rock pigeon round the Indian village. Young corn and dung seemed to be their staple diet.

Corvus coronoides intermedius. The Himalayan Jungle Crow.

Two pairs were seen between Gautsa and Phari quite close to the place where the Tibetan snow-pigeon referred to above were seen.

Corvus corax tibetanus. The Himalayan Raven.

A pair was observed near the rest house at Phari 14,600 ft. and another pair near Tuna about the same height. Several singletons have also been seen along the route beyond. They are enormous birds and comparatively tame and intelligent looking.

Pyrrhocorax pyrrhocorax. The Himalayan Red-billed Chough.

These birds have been seen on practically every march since leaving Yatung. They were breeding at the time and consequently no large flocks were about.

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I discovered two nests, one in a loose earth and stone conglomerate cliff about 40 ft. above a bend in the Tumbayung River and another in a rock cliff close to some painted idols at Saugong. Both, which, judging by the noise when the parent birds returned with food, contained well-grown youngsters. No yellow beaked or Alpine chough were seen at all.

Pica pica subsp.? Magpie.

Large black and white Magpies are common between 13,000 ft. and 13,500 ft. They fly about the cultivated fields and gardens and sit on rocks as there are few trees about. I noticed what I took to be a magpie's nest, very similar to that of the English Magpie, in a small thorn tree about 7 miles from Gyantse.

Upupa epops saturatus. The Tibetan Hoopoe.

Seen at Yatung 10,000 ft. in the Agency Garden. One solitary bird seen feeding on insects at 14,000 ft. in the Kala Plain near a dry ravine in some low hills. Several others seen at Gyantse 13,000 ft. To the ordinary observer they are indistinguishable from the Hoopoes seen in India.

British Trade Agency,

Gyantse, Tibet. R. K. M. BATTYE,

June 29, 1935. Captain.

XXVI.—A LARGE MUGGER (*CROCODILUS PALUSTRIS* LESSON) FROM BIKANER—A CORRECTION.

With reference to my letter of the 10th February 1934, which you so kindly published on pages 493-4 of your issue, vol. xxxvii, No. 2, dated the 15th August 1934, I am to state that the heading given to it i.e. 'A large Mugger (*Crocodilus palustris* Lesson) from Bikaner' gives the impression that the animal under reference was shot in Bikaner territory; whilst, that is not the case. It was shot in Kheri, United Provinces. I am sorry, this was not made clear in my letter. But although, this information, I am afraid is rather late, yet I thought you should be informed of the correct place where the Mugger came from.

Furthermore, it was obtained right inland, not far from the foot of the Himalayas and, therefore, the Estuary Crocodile (*C. porosus*) should, of course, not be confused with the specimen in question, though from the scientific point of view and as a matter of general interest measurements of *C. porosus* would also be welcome.

Bikaner. THE SECRETARY TO THE HEIR-

May 14, 1935. APPARENT OF BIKANER.

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XXVII.—THE MUGGER (*CROCODILUS PALUSTRIS* LESSON) FEEDING ON LARGE WATER-BEETLES (*CYBISTER* SP.).

A friend of mine who has shot several Mugger in the Pawai Lake, Salsette Island, has told me that an examination of the stomach contents of one of them, revealed a collection of close on sixty large Water-Beetles (*Cybister* sp. (?)), a couple of Chilwa (*Chela* sp.) and an eel, probably an Eel-pike (*Mastacemblus* sp.). It is curious to find such a large reptile, well able to feed on large fish, etc., subsisting on a diet of beetles!

BOMBAY NATURAL HISTORY SOCIETY,
BOMBAY. C. McCANN,
July 22, 1935. *Assistant Curator.*

XXVIII.—MALE RAT-SNAKES (*ZAMENIS MUCOSUS* BOULENGER) FIGHTING.

During the months of June and July this year, my neighbours, at Andheri, sent me two couples of Dhamans or Rat-Snakes (*Zamenis mucosus*) which they had shot. The snakes when shot were entwined round one another like a twisted rope, which naturally suggested that they were *in copula*. Examination, by dissection, showed that in both cases the snakes were males. This goes to suggest that the respective couples must have been fighting at the time they were shot. There are many records of snakes seen in the manner described and in most cases, if not all, that attitude has been ascribed to copulation. However, as is well known, snakes usually exhibit no obvious external sexual differences and only a careful examination aided by dissection will reveal the sex definitely.

The combatants in these two instances were of almost equal size. What the fights were over it is difficult to say; but, as the breeding season was over these snakes may have been fighting for territorial supremacy.

One of the snakes contained a semi-digested bloodsucker (*Calotes versicolor*), the stomachs of the others were more or less empty.

BOMBAY NATURAL HISTORY SOCIETY,
BOMBAY. C. McCANN,
July 16, 1935. *Assistant Curator.*

XXIX.—PRECOCITY IN YOUNG BULL-FROGS (*RANA TIGRINA* DAUD.).

Soon after the break of the monsoon Bull-Frogs appeared in full force as usual. Breeding was at its height and numerous individuals both large and small were to be seen *in amplexu* gathered round the pools and puddles. Curiously enough the frogs sorted themselves out 'according to size'; the large males and fe-

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males measuring 4-5 inches and over, occupying different pools to those of smaller size (between 2-3½ inches). The males, both large and small were all in breeding dress—pale lemon yellow, but the intensity of colour was decidedly more pronounced in the larger males. The females were the usual sombre brown. Before proceeding I must correct my previous statement in my article 'Notes on Indian Batrachians' (*J.B.N.H.S.*, xxxvi, p. 159) in which I stated, 'The females and young males are the usual sombre brown. . . .' As stated above young males are also lemon yellow when they emerge from aestivation.

In order to examine the condition of the genitals I caught and dissected several pairs that were *in amplexu*. The large males and females had the genitals well developed: the ovaries were full of eggs, and the testes decidedly enlarged. But in the smaller frogs the ovaries and testes were immature. This indicates that the sexual urge is apparently equally as strong in immature frogs at it is with so many other immature animals.

Further, it must be noted that the young males also croaked like their elders. The vocal sacs were also coloured blue and the callosities on the inner fingers were also well developed.

Bombay Natural History Society,
Bombay.
July 17, 1935.

C. McCANN,
Assistant Curator.

XXX.—ANTS ATTACKING RUBBER GOODS.

I have on several occasions been forcibly impressed by the strong attraction that rubber has for the small and very common Red House Ant. Their persistence is a source of worry and nuisance to the house-keeper in India, but when they lose their appetite for crumbs and the like, and one finds them, when one opens one's Onoto Ink Pencil, devouring the small rubber pad inside the cap, or inside the filler bulb, or again on top of one's soda-water bottles eating the red rubber washer round the marble and yet again taking great delight in honeycombing the soles of one's crepe-soled shoes, they become rather more than a long suffered curse of this country.

I have not come across any reference to this liking for rubber with regard to this ant in the world of Natural History. Whether they actually eat the rubber I have been unable to ascertain, but they are certainly very successful in reducing it to powder. They seem to prefer crepe and red rubber to vulcanised rubber and that used for erasers.

It would be interesting to know if any other readers of the *Journal* have observed this rubber 'eating' propensity.

Naduar Estate,
Valparai P.O.,
South India.
June 11, 1935.

R. N. CHAMPION-JONES.

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XXXI.—OCCURRENCE OF THE BEETLE *STERNOCERA CHRYSIS* IN WAZIRISTAN.

In November 1932, I sent you some *Buprestid* beetles from South Waziristan, and in your letter of 18-11-32, you stated that you were sending them to England for identification. Were they ever identified?

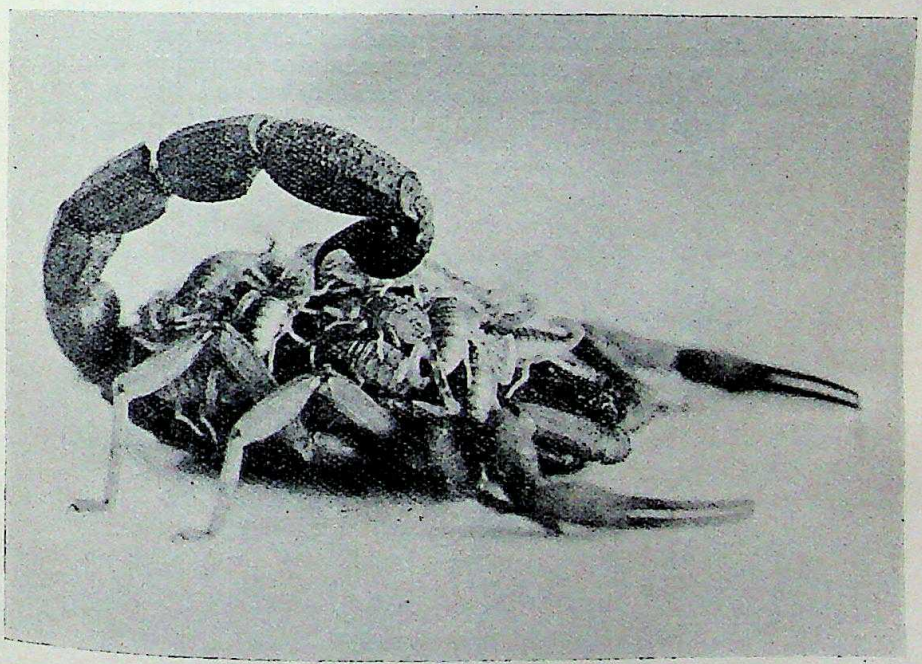
ROYAL GARHWAL RIFLES,
LANSDOWNE, U.P.
April 7, 1935.

D. G. LOWNDES,
Captain.

[The beetles were identified by the British Museum as *Sternocera chrysis*. This is a common species which has been recorded so far only from South India and Ceylon. Its discovery in Waziristan is interesting.—EDS.].

XXXII.—PARENTAL CARE IN SCORPIONS.

A correspondent, in the last number of the *Journal* (15 April, 1935) asks 'Do young scorpions eat their parent?'



A female scorpion (*Buthus* sp.) mothering her young.
Photo by G. K. Powle.

I should think that it is quite impossible to perform this act of cannibalism. For a considerable time, after birth, young scor-

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pions remain soft bodied and of a milk-white tint. The hardening of the dermal tissues is very gradual and slow, and their small chelae could make no impression upon the parent's coat-of-mail.

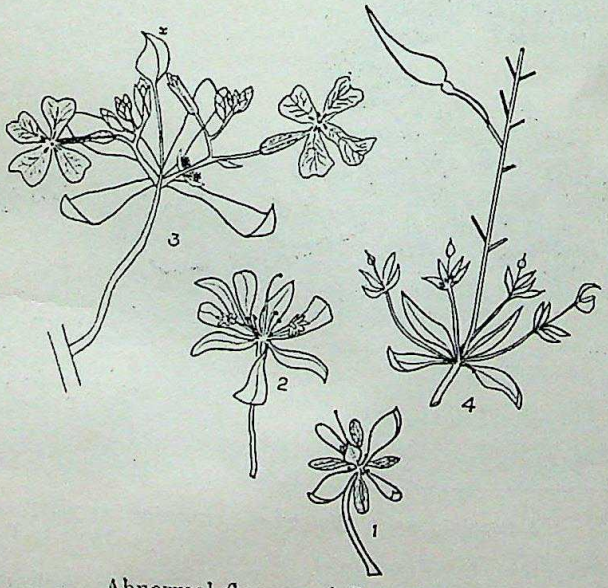
On the other hand, I have kept a mother scorpion and her brood in captivity and—although provided with other insect food—have seen her pick off and devour her babies, one by one, until none were left. I do not suppose that this is a natural habit; but it possibly objected to the publicity of repeated inspection.

My captive scorpions were thirsty creatures. I used to give them water to drink through a pen-filler. It was amusing to see how soon they came to recognise this instrument. They would reach up, seize the nozzle in their chelae, and apply it to their mouths. They would, in the same way, enjoy an occasional drink of milk.

WAY'S END, BEECH AVENUE,
CAMBERLEY, SURREY. E. ERNEST GREEN.
May 27, 1935.

XXXIII.—ABNORMAL FLOWERS OF THE RADISH (*RAPHANUS SATIVUS* LINN.).

The abnormalities described below were noted in a plant, produced by one of the seeds sown by me, in a plot in the Training College, Agra. This plant had a peculiar bushy appearance on account of several vegetative and reproductive branches coming out from the base. These branches curve down and rise upward bearing a large number of abnormal flowers described under two main types:—



Abnormal flowers of *R. sativus*.

Type A. (Fig. 1): The four sepals are thicker and broader

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than those of the normal flowers and have acute apices. Moreover, one pair of sepals is larger than the other. Similar is the case with the four petals which are sometimes sepaloid (green) and twice as big as sepals. They can be recognised by their obovate clawed shape and crumpled condition. All the stamens of the tetradynamous androecium are sterile. In place of the gynaecium there arises a peculiar looking inflorescence enclosed in a membranous sheath (marked x in Fig. 3) or an ordinary inflorescence with fertile normal flowers. The former consists of normal fertile flowers, or sterile flowers, or abnormal flowers. Sometimes, there is only one abnormal flower inside the sheath.

Around the central inflorescence (x) arise additional (1 to 4) inflorescences and one or more abnormal flowers (Fig. 4.). In some cases, one or two bracteate abnormal flowers arise secondarily on the pedicel of an abnormal flower.

Type B (Fig. 2): Some abnormal flowers have rosy petals and out of the six stamens the two lateral ones are replaced by two inflorescences of fertile flowers. Such a flower is bisexual and produces a fruit which is on an average only 2.5 in. long and contains 6-10 big but thin seeds. Such flowers occur in inflorescences which are not typically racemose, as, sometimes, two flowers are situated opposite to each other at a node.

Fruits produced from normal flowers of this plant are unusually small (1.5 in. long and .4 in. in diameter) and produce only one or two seeds.

I am thankful to Mr. B. L. Gupta of the Agra College for assistance in the interpretation of the abnormalities and to Mr. L. P. Gupta of the Training College, Agra, for permission to keep the plants under observation and send this note to the press.

TEACHERS' TRAINING COLLEGE,
AGRA. AGHA MOHAMMAD.
April 18, 1935.

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PROCEEDINGS OF THE MEETING HELD ON 1ST. OCTOBER 1935.

A meeting of Members of the Bombay Natural History Society and their friends was held at the Prince of Wales' Museum on Tuesday the 1st of October at 6-15 p.m. The Hon'ble Mr. Justice Barlee presided.

Mr. P. M. D. Sanderson, the Honorary Secretary, gave a short account of the present activities of the Society and announced the election of 12 new members since the last meeting held in August, making 48 since January last, and bringing the total to approximately 1,200.

Mr. J. B. Rowntree, I.F.S., Nowgong, Assam; Mr. J. W. Houlton, I.C.S., London; Mr. E. K. Krishnan, Mangalore; The Officers' Mess, Royal Indian Navy, Bombay; Capt. W. P. H. Gorringe, Ambala, Punjab; Mr. C. E. C. Chandler, Barahapjan, Upper Assam; Mr. J. D. Jenkins, Poona; The Librarian, Chulalongkorn University Library, Bangkok; Major C. G. Toogood, D.S.O., Military Secretary to H. E. The Governor, Bombay; Maharaj Kumar Shree Chandrabhanusinhji of Wankaner State, Wankaner, Kathiawar; Lt.-Col. M. D. Vigors, D.S.O., M.C., Saugor, C.P. and Mr. Shanker Wamanrao Muzumdar, Bombay.

He also referred to an expedition of Mr. McCann, the Assistant Curator, and two other members of the staff. Due to the kindness of H. H. the Maharao of Kutch and the assistance of Mr. Steer-Webster, Technical Adviser, they were now trying to procure photographs and paintings of the nesting sites of flamingoes which were breeding about a hundred miles out in the great Rann of Kutch. It was hoped that the results of this expedition would be on view before very long in the Prince of Wales' Museum.

Lecture by Right Rev. R. D. Acland.

Specimens on Table.

The Bishop then gave his lecture on the wild flowers of Bombay. Although he spoke for only an hour, he covered an immense amount of ground and in spite of the unavoidable technicalities of the subject, he contrived to make it so interesting that even the veriest beginner could understand. In front of him, on a long table, was spread a large number of wild flowers which he himself had collected that day.

As each specimen was handed to members, he described in vivid and attractive manner how it could be identified. There were a number of books on the table, including Nairne's *Flowering Plants of Western India*,—still a wonderful help to the botanist, although it is now 40 years since it was published. There were also a small magnifying glass with a hinged stand, a knife etc. on the table, but the Bishop said 'all that is required to follow this fascinating study successfully is the intelligence of a girl of 12 and the patience and persistency of a boy of 15'.

It was a pity that the meeting on this subject could not have been held earlier, say in June, when so many more plants were in flower. However, in spite of this, the obvious keenness of the lecturer, which was soon shared by his hearers, and his wide knowledge of botany made the meeting one of the most interesting the Society has had.

The thanks of the Society were wittily expressed by Mr. Justice Barlee.

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Continued from page 188 of Vol. XXXVII, No. 4 of the Journal of the Bombay Natural History Society.

THE WILD ANIMALS OF THE INDIAN EMPIRE

AND THE

Problem of their Preservation

Part IV.

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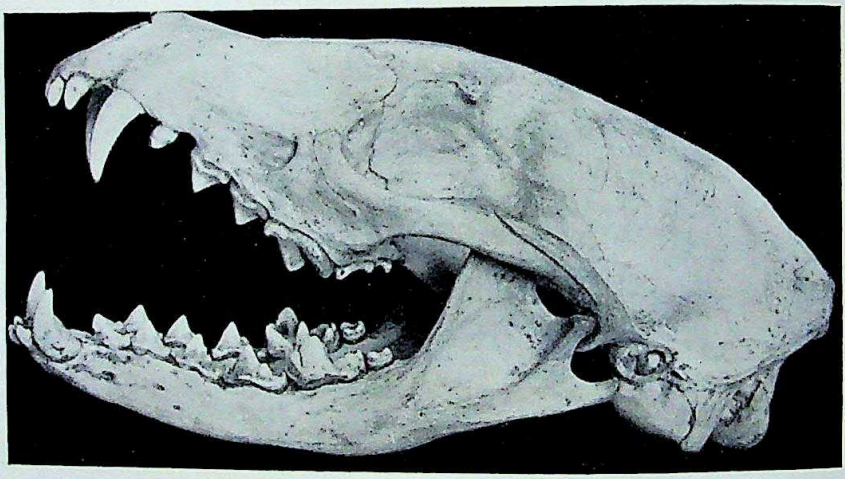
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Skull of the Large Civet (*Viverra zibetha* Linn.).

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THE WILD ANIMALS OF THE INDIAN EMPIRE.

Part IV.

CARNIVORA OR BEASTS OF PREY—(*continued*).

Family: II. *VIVERRIDAE*: CIVETS, GENETS, etc.

The family includes the True Civets and their numerous relatives—Genets, Palm Civets, Lisangs, Bear Cats. They form a diverse assemblage of animals, which in certain characters connected with the structure of the skull and the anatomy of the body display some affinity to the Cats (*Felidæ*) and, they are generally regarded as their next of kin. Nevertheless the Civets do not reveal that uniformity in build which is so distinctive of the Cat Tribe. Marked structural differences among them make it difficult to provide a general definition which would distinguish them as a tribe from other beasts of prey. They differ from cats in many ways. None of the civets attain the size of the great cats, they are all comparatively small creatures, long in body, short in limb with elongated heads and pointed muzzles. We have seen how the teeth of cats show a marked adaptation to a purely carnivorous diet; how specialization to this end is revealed in a shortening and strengthening of the jaws, in a marked development of the canine teeth and in a reduction in the number of molar teeth, whose blade like crowns make them perfect cutting instruments. The jaws of civets on the other hand show no reduction in the length and carry almost the full number of teeth of a typical carnivore. They have a larger number of cheek teeth than any of the existing cats.

All the Indian members of the tribe have four premolar teeth on each side of the upper and lower jaws and one or more true molars. The canine teeth are more feeble than those of cats, the flesh-tooth is less trenchant and more tubercular in character. The long pointed cusps of the cheek teeth of some of the *Viverridae* recall the dentition of an insectivorous animal; while the molars of others, like the Palm Civets and the Bear Cat, which feed largely on fruit, have almost lost their carnivorous character. The teeth of civets help to show how, within the limits of a single family, while the family characters of the dentition may be retained, the form and size of the teeth may vary in accordance with the habits of life and the food of the individual species.

In the structure of the feet again the civets display a lesser degree of specialization than the cats. The number of toes both in the fore and hind feet is generally five. This is seen in all the Indian members of the tribe, whereas cats have five toes in the fore foot and four in the hind. The claws vary in retractability. In some forms, as in the True Civets (*Viverra*), some of the claws of the fore feet are as retractile and as well protected by sheaths as in many species of cats. In other forms this

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character is less apparent. Yet another point of distinction in civets is the entire absence of the sharp pointed conical papillae which convert a cat's tongue into a rasp.

It will be seen that while the civets display some affinity to the cats; their general equipment as beasts of prey places them on a lower level. They display in their build and their armament of teeth and claws a lower degree of adaptation to carnivorous habits of life.

No representative of the family exists in America or Australia. All its members are confined to the warmer parts of the Old World, chiefly to Africa, Madagascar and South-Eastern Asia. One species is found in Southern Europe.

Pocock in his classification of the family recognises a number of gropus or sub-families. The following occur in our area:

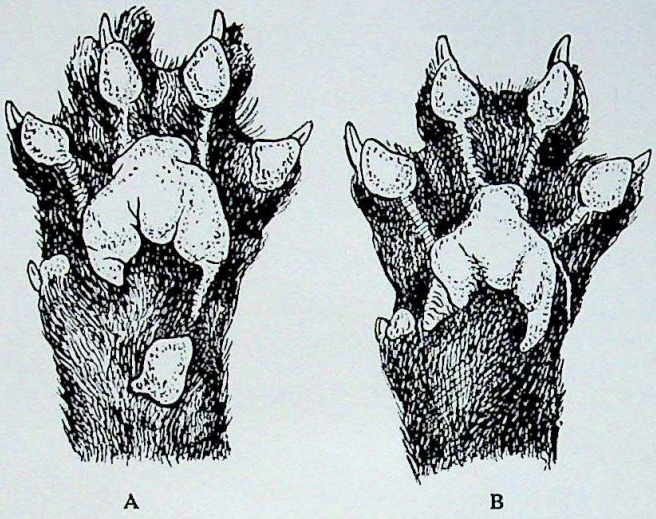
Sub-family	*Viverrinae*:	True Civets.
,,	*Paradoxurinae*:	Palm Civets.
,,	*Prionodontinae*:	Tiger Civets or Lisangs.
,,	*Arctogalidinae*:	Small Toothed Palm Civets.
,,	*Hemigalinae*:	Banded Civets.

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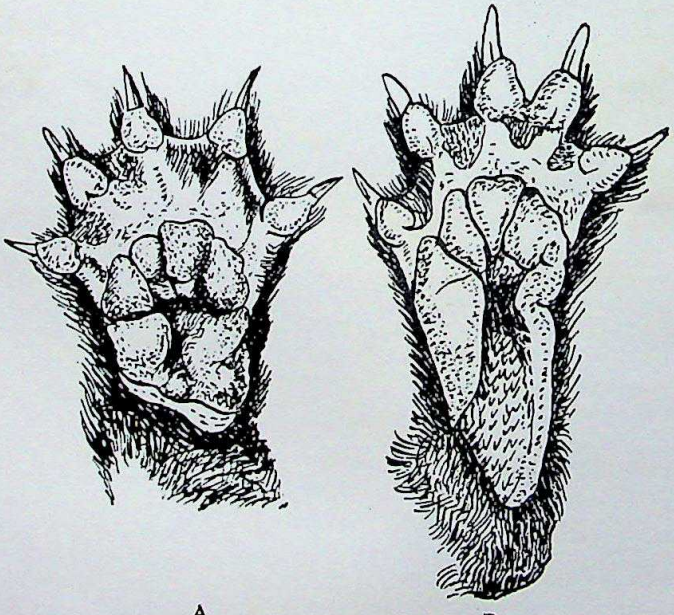
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A B

Fig. 1.—Feet of *Viverra zibetha*, a true civet of terrestrial habits, showing hairy soles and reduction of pads. (A, Left forefoot; B, Left hindfoot.)



A B

Fig. 2.—Feet of *Paguma larvata*, one of the arboreal Palm Civets showing comparatively naked soles and greater development of the pads for grasping the branches of trees. (A, Left forefoot; B, Left hindfoot.)

After Pocock (*Proc. Zool. Soc. Lond.*).

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Sub-family: 1. *VIVERRINAE.*

True Civets.

The Civet tribe (*Viverridae*) has been differently classified by various naturalists. Pocock in his recent classification limits the sub-family *Viverrinae*, which includes the true or typical Civets, to five genera. They are as follows: The Large Oriental Civets of the genus *Viverra;* a second genus *Moschothera*, formed to distinguish two large civets, one found in Malabar, the other in Lower Burma and the adjoining Malay countries; the small civets of the genus *Viverricula;* and finally the two African genera *Civettictis* and *Genetta.*

Apart from the Genets which are found also in Southern Europe, the True Civets are confined entirely to the Oriental and Ethiopian region.

The *Viverrinae* or True Civets form a compact little group, distinguished from the Palm Civets or Paradoxures by the form of their feet and the more elaborate structure of their scent pouches.

In these True Civets, the plantar or central pad under the fore foot is reduced in size and, compared with the Palm Civets, there is an even greater reduction in the size of the carpal pad (a small pad in the region of the wrist). On the hind foot the corresponding pad is almost or entirely suppressed. Further in the True Civets the whole under-surface of the foot with the exception of the pads is almost completely covered with hair. The growth of hair under the feet, the reduction or suppression of the carpal and plantar pads is variable in different members of the group. But on the whole these characters, which are more or less marked in True Civets, indicate a greater adaptation in these animals to a terrestrial life. Palm Civets, on the other hand, are mainly tree-dwelling animals. Their naked soles and well developed pads fit them in a greater degree for an arboreal existence.

Like cats, true civets walk upon their toes, and their feet bear a close superficial resemblance to the digitigrade feet of cats. This resemblance is seen particularly in the reduction of the carpal pads and in the hairiness of the under foot. The resemblance is carried further in certain members of the group such as the Small Civets (*Viverricula*) whose feet are perhaps the most feline in character. In these little civets, as in cats, the hallux and pollex, or those digits which correspond to the thumb and big toe, are placed high up on the foot and at some distance from the ther digits. Again in the large civets of the genus *Viverra* some of the claws of the fore feet are protected with sheaths of hairy skin. These claws are therefore as retractile as those of many species of cats. As we have already seen, the extent to which different species of cats can sheath their claws varies considerably.

The true civets have well developed scent glands. They produce the well known perfume which gives the name to the tribe. The word 'civet' is derived from the Arabic term *zabat*, a name

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used for the scent derived from the glands of these animals. The structure of these glands varies in different members of the group. It may even differ to some extent in males and females of the same species. These glands generally take the form of two elongate eminences covered internally and externally with hair. They are found in both sexes and lie just in front of the testes in the male and in a corresponding position in the female. In Genets the two lobes of this gland lie closely apposed. Their line of contact is marked with a Y-shaped groove. When pulled apart the space between the glands will be found to consist of three compartments separated by folds of skin. The secretion of the glands exudes into these compartments from clusters of tiny pores in the lateral walls. In the large Oriental Civets (*Viverra*), the glandular space between the lobes is not divided into compartments. Nor are the two lobes of the gland closely apposed through their entire length. In their posterior half towards the scrotum the two glands are somewhat widely separated, but anteriorly their inner margins fuse together to form the roof of a deep pouch, which constitutes a large storage chamber for the secretion of the glands. In a male of the large civet (*V. zibetha*) examined by Pocock the naked skin between the testes was found to be glandular as also a thick fold of integument which almost completely encircles the anus. The secretion from the gland surrounding the anus has however a very different and extremely offensive odour. The secretion from the perfume gland is used both for perfumery and for medicinal purposes. In India it is held to have valuable medicinal and aphrodisiac properties. The secretion contains free ammonia, resin, fat, and a volatile oil to which its ordoriferous properties are due. It is a strong smelling perfume and requires a highly trained nose for its appreciation. The so-called 'civet' perfume of commerce which is imported into India, comes from America. It is not obtained from civets, but is taken from the Beaver.

In India the secretion is collected from the Large Indian Civet (*V. zibetha*) and to a greater extent from the Small Civet (*V. malaccensis*). It is much sought after by some of the Brahmins of Malabar and as much as Rs. 10 per tola is paid for the pure essence. The 'civet' obtainable in the bazaars is much adulterated with butter and oil to increase its weight. The best prices are paid for the entire pouch cut from a freshly killed animal. The usual method of collecting 'civet' is to scrape it out of the animal's scent pouch with a wooden spoon. It is recorded that there was an establishment once maintained at the expense of the Travancore Government in which civets were reared for the purpose of collecting the perfume. Numbers of Small Indian Civets are still kept at Kolar in East Mysore for the same purpose. 'Civet' is very largely produced in Java from the Javanese race of the animal (*V. indica rasse*), where it is used very considerably for flavouring tobacco smoked by the Javanese.

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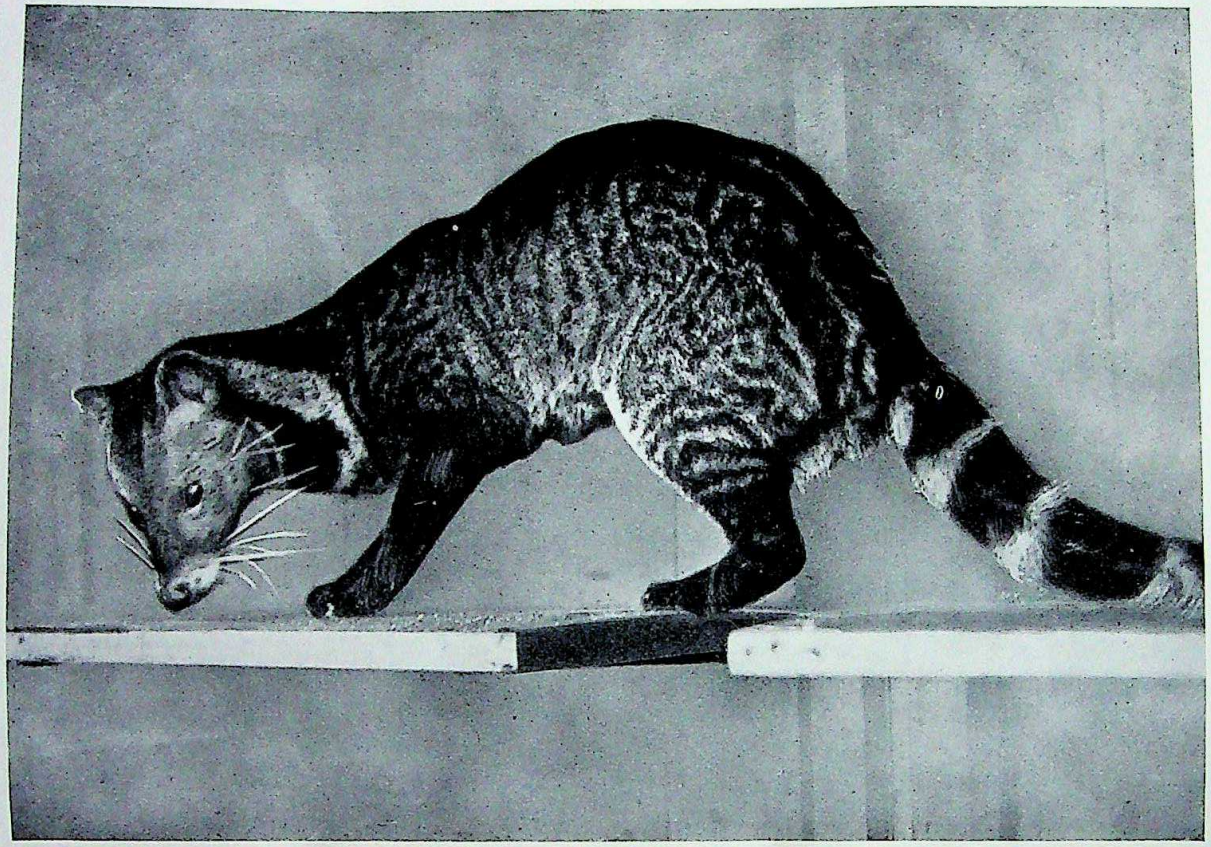


Photo by *W. S. Berridge.*

The Large Indian Civet (*Viverra zibetha* Linn.).

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THE LARGE INDIAN CIVET (*VIVERRA ZIBETHA* LINN.).

This Large Civet is found from North India and Northern China through Burma, Siam and the Malay Peninsula.

It is a sturdily built animal with a long head, long flattened body, stumpy legs and small rounded feet—a build, typical of the true civets. An adult animal measures nearly 4 feet in length: its thick tapering tail is more than half as long as the head and body.

The general colouration is a dark hoary grey, frequently washed yellowish or brown. An erectile crest of long deep black hairs runs down the middle of the back. The crest is distinctive and differentiates the Large Civets from the Small Civets of the genus *Viverricula*. The crest forms a heavy black stripe from the shoulders to the first ring of the tail. The tail is completely ringed with six broad black bands. Pale bands form an edging to the black dorsal crest. There are several dark bands on the chest and shoulders. The sides of the body are either plain or have more or less distinct markings. Such markings may be obscured or obliterated in the longer and more luxuriant winter coat. A seasonal change of coat takes place between May and July. It is more marked in animals inhabiting the northern areas of the civets range.

The luxuriance or otherwise of the winter coat and the prominence of pattern are some of the characters which are used to differentiate between the various races of this animal. The typical race (*V. z. zibetha*) is found in Nepal, Sikkim and Northern Bengal. Compared with the Chinese race (*V. z. ashtoni*), it has a moderately long winter coat. The race from Burma and Assam is *V. z. picta*. It is said to be distinguishable by the persistence of pattern even in the winter coat. A third race, *V. z. pruinosa* is found in Tenasserim and the Malay Peninsula. It is distinguished from the more northern races by the shortness of the coat and distinctness of its pattern in the winter months, seasonal variation in coat in this race is very slight. A fourth race *V. z. surdaster* is described form Indo-China.

The Large Indian Civet is a solitary creature sheltering in bushes, thick grass or heavy scrub jungle by day, and coming out to hunt by night. It preys on small animals and birds and may be very destructive to poultry. Like most carnivores, it feeds on anything worth killing and its food may include, snakes, frogs, fishes, crabs and even insects. It is not exclusively carnivorous, and feeds equally on fruits and certain roots. It takes readily to water. It breeds in May and June, and usually has four or five young. The scent glands, are large, measuring, when dissected out, about 2.5 inches in length and 1.5 in. in breadth. Dogs are said to be greatly excited by the scent of this civet and will leave that of any other animal for it.

In addition to the Large Indian Civet (*V. zibetha*), two other large species are found in our area. They are the Large Malabar Civet (*Moschothera civettina*) found in Travancore and Cochin,

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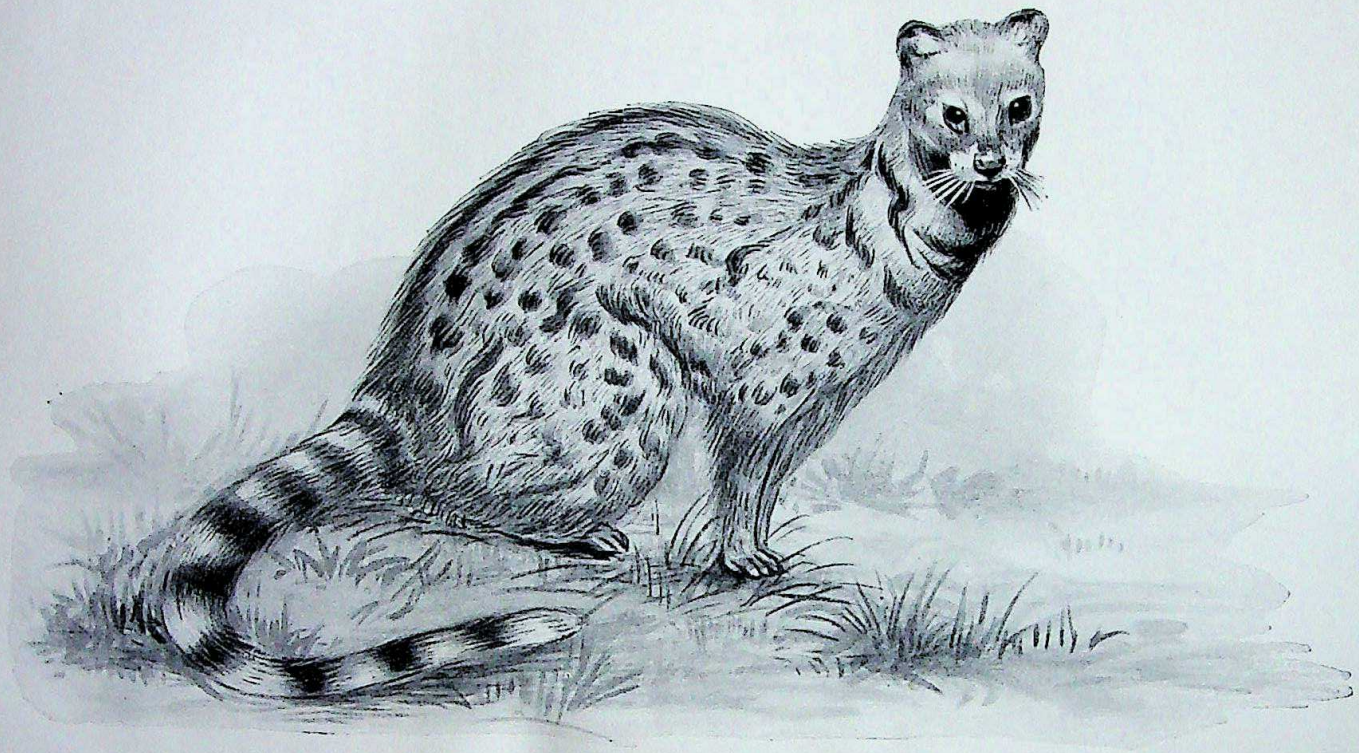
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and the Burmese Civet (*M. megaspila*) which is found in Southern Burma, Siam, Annam, Cochin China and the Malay Peninsula. These two civets, now regarded as representing a distinct genus, differ from the Large Civets of the genus *Viverra* by the absence of sheaths to the claws of the fore feet, and by the comparatively hairless condition of the skin between the pads of the feet. Both species are very rare. The general colouration and markings are very similar to the Large Indian Civet, except that the white bands on the tail do not completely encircle it. The general habit of these civets are similar to those of the Large Indian Civet.

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Del.

The Small Indian Civet (*Viverricula indica* Geoffroy).

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THE SMALL INDIAN CIVET (*VIVERRICULA INDICA*, GEOFFROY).

The Small Civet is found in the Peninsula of India, from Sind, the Punjab and the foot hills of the Himalayas, southwards to Ceylon and eastwards through Burma into Southern China, Indo-China, Annam, Burma, Malacca and Java.

The absence of a dorsal crest of long black hairs will serve to distinguish this civet from the large civets of the genus *Viverra*. It is a much smaller animal. A well grown adult male is a slightly over 3 feet in entire length, the tail being a little over a foot long. It scales from 6-8 lbs.

The general colouration of a typical specimen from Southern India varies from brownish or olivaceous grey to light grey. There are longitudinal dark stripes and rows of spots along the body, a stripe down each side of the neck and frequently one across the throat. The tail is ringed with grey and brown. The under-fur is brownish or greyish and varies in density. Before the moult the coat becomes hard, brittle and lustreless. The change to the fuller winter coat takes place after September.

Various Indian races of this civet are now recognised. The distinctions between these forms are based on colouration, size, cranial and other characters. The typical race (*V. indica indica*) is said to inhabit Southern India from the Western Ghats across the peninsula to the Eastern Ghats as far as the Chilka lake in Orissa. A second race, *V. i. bengalensis* is apparently found in the central portion of India, south of the Ganges, from Calcutta to Gujerat and possibly in Sind. More or less distinct races are said to occur also in the following areas: *V. i. deserti* (Rajputana); *V. i. wellsi* (Punjab and the United Provinces); *V. i. baptistae* (from Bhutan, Upper Bengal, Assam); *V. i. thai* (from Siam and Indo-China and probably also in Upper Burma); *V. i. klossi* (in the Malay Peninsula and apparently in Lower Burma); *V. i. mayori* (in Ceylon). A detailed description of these races will be found in Pocock's monograph on the 'Civet Cats of Asia' published in the *Journal of the Bombay Natural History Society* (vol. xxxvi, p. 647).

The Small Indian Civet is a shy seclusive animal, almost entirely nocturnal in its habits. It lives in holes in the ground or under rocks or thick bushes. It is frequently found in the neighbourhood of villages or even within the large towns. It climbs well and will scale a vertical tree trunk with ease. It is more arboreal in habit than is usual with the true civets. Though it kills poultry when opportunity offers, like other civets, it prefers preying on rats, lizards, small birds and insects. It feeds on fruit and is fond of the berries of the Ber (*Zizyphus jujuba*). It is easily tamed. The species is frequently kept under domestication for collecting the secretion of its scent glands.

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Sub-family: 2. *PARADOXURINAE.*

Palm Civets.

The Civet Tribe (*Viverridae*) contains a second group of animals —the *Paradoxurinae* of which the Palm Civets or Toddy Cats are the dominant members. This group also includes the Binturong or Bear Cat (*Arctictis*) and a rare genus of civet from the Celebes (*Macrogalida*).

External characters which distinguish the Palm Civets from the true civets are seen in the form of the limbs. The Palm Civets are short-legged animals. Unlike true civets, they walk to a greater extent upon the soles of their feet. Again in distinction to the true civets, the soles of the feet, both in the fore and hind limbs, are almost completely naked. Further the greater development of the pads which lie behind the central or plantar pad of the foot indicates a more perfect adaptation in these animals to an arboreal existence than is revealed in the true civets.

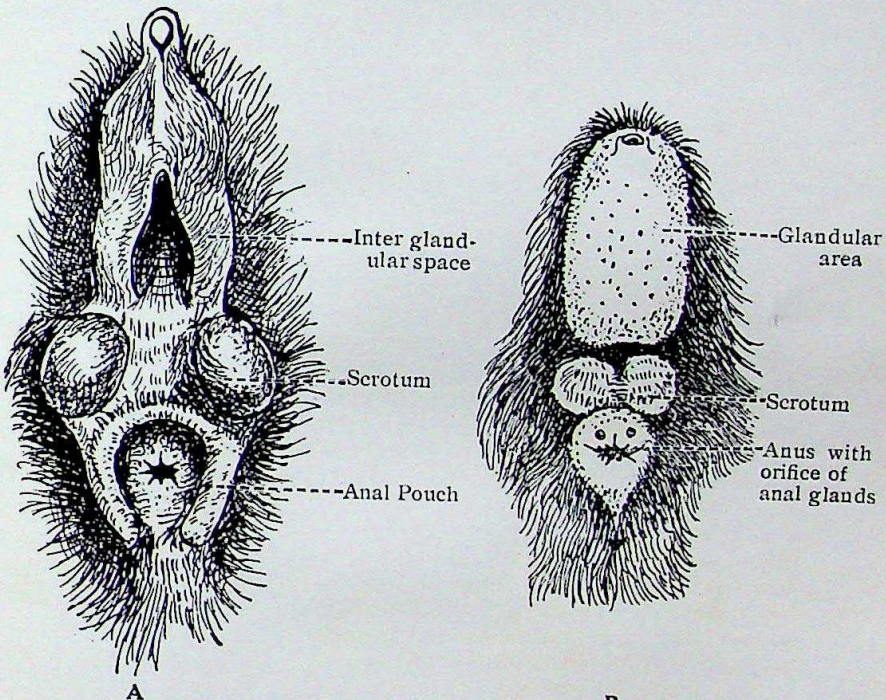
The perfume glands are also very different from those of the true civets. The plan of their structure is much less elaborate. The secretion of the glands is discharged into a slight fold of skin instead of a deep pouch. There is a large area of naked skin, corresponding to the glands in front of the scrotum in the males and around the genito-urinary orifice in the females. The secretion from the anal gland in some forms is singularly fetid and can be discharged under stress of fear or excitement. The teeth vary very much in development and are very large in some species while they are small in others. They are suited to the mastication of both animal and vegetable food.

The Palm Civets are comprised in two genera, *Paradoxurus* and *Paguma*, which are distinguished by characters of the skull. These animals are exclusively Asiatic, ranging from India, Burma, through the Malayan Region to the South of China. They also occur in the Philippines, Celebes and Formosa.

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PERFUME AND ANAL GLANDS OF CIVETS.



A

A.—Inferior view of the anal glandular area of the Large Civet *Viverra zibetha* (male).

B

B.—Inferior view of anal glandular area of the Common Palm Civet *Paradoxurus hermaphroditus* (male).

After Pocock (*Proc. Zool. Soc. Lond.*).

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Photo by *W. S. Berridge.*

The Common Palm Civet (*Paradoxurus hermaphroditus* Gray).

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THE COMMON PALM CIVET OR TODDY CAT (*PARADOXURUS HERMAPHRODITUS* GRAY).

The best known of all the Palm Civets is the Common Palm Civet or Toddy Cat (*Paradoxurus hermaphroditus*). It is found in Ceylon and practically over the whole of India from the Himalayas to Cape Comorin. Eastwards its range extends through Assam and Burma to South China and the Malay countries and Islands as far east as the Philippines, Borneo and the Moluccas. Blanford in his *Mammals of India* applied the name *niger*, to the Indian Palm Civet and the name *hermaphroditus* to the Malayan species. Pocock in his recent review of the species recognises but one species as inhabiting India and South-Eastern Asia, and considers the name *hermaphroditus* as more correctly applicable to it.

The tail of the Common Palm Civet is nearly or quite as long as its head and body which may be slightly over 2 feet in length. Its weight averages from 6 to 9 lbs.

The general colour of its coarse, somewhat ragged fur is black, blackish or brownish grey, the shorter grey or brown under fur of the coat, when present, is partly or wholly concealed by overlying longer and darker hairs. These longer hairs are generally paler towards the tips and as such hardly distinguishable in colour from the pale under wool. But in certain areas of the body the long hairs of the coat are dark throughout. These dark areas by contrast with the paler surrounding hair tend to suggest a pattern of black stripes on the back. A similar suggestion of spots is seen in the flanks and sometimes on the thighs and shoulders. This pattern is not always obvious. It is generally most prominent in an animal which has freshly moulted its hair. The season of coat change varies in different localities. Generally, the civets are in poor coat between May and October, and in full coat between December and March. The change of coat naturally makes a profound change in the general appearance of the animal. It is more marked in some localities and less appreciable in others. The luxuriance of the coat, the extent of development of the under fur, the obviousness or otherwise of the pattern, the comparative size of the teeth, minor distinctions in the skull have been used as characters to distinguish between the numerous races of the civet. The typical form is said to occur in Central and Southern India and Ceylon.

The Civet is generally known in India as the Toddy Cat, because of its habit of climbing Palmyra palms to drink the toddy which flows into the jars hung up by the toddy-drawers. In Java the species is known as the 'Coffee Cat', owing to its habit of collecting in numbers round coffee plantations to feed on the ripe berries. The seeds of the berries are passed out whole by the animal, generally on a pathway or against the stumps of trees. They are subsequently collected by the coffee gatherers when the regular picking is over. Palm Civets appear to be largely frugivorous, though like other civets, they feed on small animals, birds and insects. They are arboreal and rest by day concealed among

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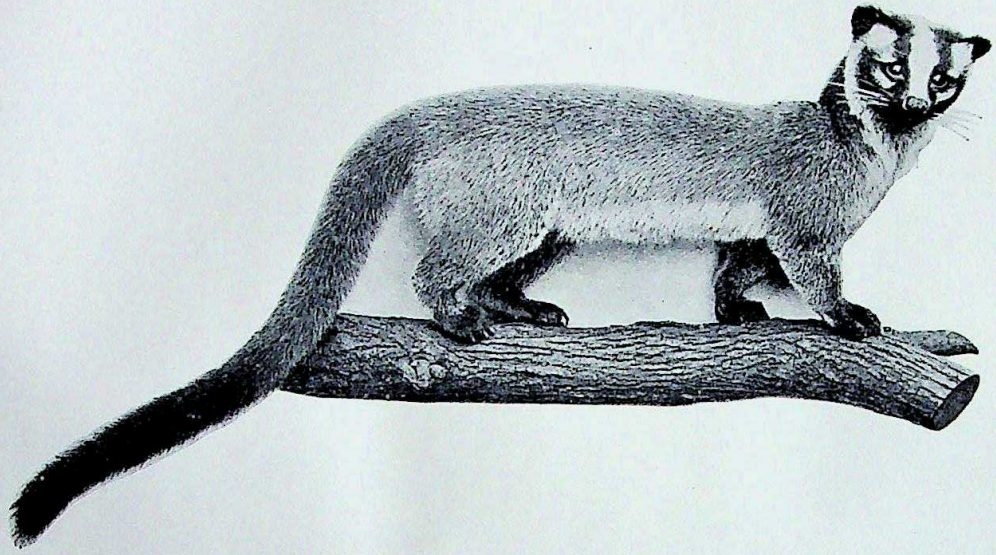
the branches of a tree or curled up in a hole in the trunk. They are common round villages and have even been found in the centre of towns and cities. They usually select to live in the rafters of houses, or in drains and come out at night in quest for food. When taken young this civet is easily tamed and in confinement eats cooked food of almost any kind. The animal probably breeds throughout the year. The majority have their young after the rains, during the cold weather, 4-6 young are born at a time.

A second species of Palm Civet, the Brown Palm Civet (*P. jerdoni*), is found in the hill ranges of Southern India. It is distinguishable from the Common Palm Civet by its rich deep brown colouring, the back and flanks are somewhat grizzled. The vibrissae (whiskers) are dark brown. Unlike the Common Palm Civet the hair on the neck of this civet is reversed and its growth is directed forwards towards the head. Its habits are similar to the Common Palm Civet.

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The Chinese Palm Civet (*Paguma larvata* Gray).

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THE CHINESE PALM CIVET (*PAGUMA LARVATA* GRAY).

The genus *Paguma* is now considered to include but two species of Palm Civet, the Tibetan Palm Civet (*P. lanigera*), about which little is known, and the Chinese Palm Civet (*P. larvata*). The Himalayan Palm Civet (*P. grayi*) and the Sumatran Palm Civet (*P. leucomystax*) are now looked upon merely as racial forms of the Chinese Palm Civet whose range extends from Southern China to the Himalayas as far west as Kashmir and reaches southwards through Burma to the Andaman Islands, Sumatra and Borneo.

The Chinese Palm Civet (*P. larvata*) is distinguished from the Common Palm Civet (*Paradoxurus*) by certain characters of the skull. Its skull is more robust, has a broader waist, and the bony palate extends well beyond the molar teeth of the upper jaw. From differences in the muscularity of the skull and the less trenchant character of its teeth it is inferred that *Paguma* is less predatory and more of a vegetable feeder than *Paradoxurus*.

Externally, the Chinese Palm Civet may be distinguished by its white whiskers and by the entire absence of any suggestion of spots or stripes on its body. The general colouring ranges from grey to tawny. The lower parts are paler or whitish. The under fur is brownish, grey or dusky. Markings more or less obvious are present on the face. More or less distinctive is a fringe of white hairs in front of the ears which projects over the cheeks. A line running down the middle from the forehead to the nose, and a blotch or spot below each eye usually stand out as markings from a more conspicuous intermingling of white hairs. The whiskers are mostly white. In a male and female of this species captured in Almora District, United Provinces, the male appeared to be altogether darker in general colouration. Its facial markings were less pronounced—more grizzled—the darker hairs predominating. The facial markings of the female were on the other hand more distinct and stood out more clearly from a predominance of white hairs in the markings. How far this differentiation in the colouring of the sexes is prevalent remains to be ascertained. There is much individual variation in the facial markings. They may be well emphasised or indistinct, the nape of the neck may be pale or dark brown or black or conspicuously speckled with grey. Variation is also seen in the development of the fringe of hairs in front of the ears and in the length of the winter coat. These variations may be to some extent correlated with certain areas of the animals' distribution and are used to distinguish various geographical races of this civet. Six races are recognised as occurring in the Indian Empire. Descriptions indicating the distinctive characters of these races will be found in the *Journal of the Bombay Natural History Society* (vol. xxxvii, p. 326).

As regards size, the Himalayan forms stand midway between the small Chinese race and the large Malayan races. An adult

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male from Kumaon measured a little short of 4 ft. 2 in. in total length of which 2 ft. was tail. Its weight was 11½ lbs.

The habits of this Palm Civet are very similar to those of the Common Palm Civet. It is perhaps more frugivorous—though, like all civets it subsists also on animal food, eating anything which it can kill. It is a creature of mountain forests, living and breeding in holes in trees. Four young were found on one occasion. It is easily tamed and in captivity is described as being of 'cleanly habits, without the unpleasant odour usually emitted by civets'. But when irritated this civet is known to discharge a thin, most fetid yellow fluid from its anal glands. It is probable that the Common Palm Civet shares this habit which is obviously a means of defence. The prominent white vibrissae (whiskers) are highly sensitive and apparently used in some way to ascertain the nature of the food. They are very mobile, and are projected forwards or switched back in the direction of the cheeks. It was observed in the case of a captive pair that fruit, when presented to them, was always first touched with the tips of the projected whiskers before it was accepted. The female when given an apple usually took it in her fore paws and, squatting on her haunches, ate it in the manner of a squirrel eating a nut. This particular pair of civets were caught in a trap baited with ripe tomatoes. They had eaten about fifty of these fruit from a tray left out the night before.

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The Binturong or Bear Cat (*Arctitis binturong* Raffles).

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THE BINTURONG OR BEAR CAT (*ARCTICTIS BINTURONG* RAFFLES).

The Binturong is easily distinguished from other civets. The back of its ears is clothed with tufts of long hairs, while its long coarse shaggy coat is suggestive of a bear's. Its tail is long and prehensile, very thick at the root, tapering gradually, and covered with bristly straggling hairs longer than those on the body. The soles of its hind feet are naked to the heel. In these characters the Binturong differs from its relatives the Palm Civets. Nevertheless it reveals a resemblance to them in the structure of the scent glands and in the fusion of the pads of the third and fourth toes of its hind feet.

This civet is found in Nepal, Sikhim, Bhutan, Assam, Upper Burma and Indo-China from thence its range extends southward through Arrakan, Tenasserim, Sumatra, Java and Borneo.

The general colouring of the animal is black. The hair of the face, the limbs, the nape, flank and rump may be tipped or 'ringed' with grey, tawny or foxy red. When profuse the variation may reduce the dominant colouring from black to grey or tawny. This is particularly noticeable in animals from India, Burma and Indo-China, which are regarded as a distinct race (*A. b. albifrons*). These northern animals are also characterised by the length and luxuriance of their winter coats. In the typical race, which inhabits Tenasserim and the Malay Peninsula, the winter coat is shorter and the general colour consistently darker, the long hairs never being profusely anulated. The skull, as compared with that of the northern form, is larger and more massive. A large Binturong from Siam had a total length of 66 in. of which 34 in. was the head and body measurement, 32 in. the tail. Recorded weights vary from 13 to 25½ lbs.

The Binturong lives in dense forests. Owing to its seclusive nocturnal habits, it is seldom seen and is therefore comparatively rare in Museum collections. Like other civets, it is carnivorous, feeding on small animals, birds, fishes, earthworms. It also eats fruit. It is arboreal in habit and uses its prehensile tail as an aid in climbing. It is the only placental mammal in the Old World with a truly prehensile tail. Its ability to support itself by its tail has been doubted, but it has been observed that the young at any rate can support themselves by the extremity of the tail alone.

Nothing is known about the breeding habits of this animal.

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Sub-family: 3. *PRIONODONTINAE.*

The Tiger Civets or Lisangs.

THE SPOTTED TIGER CIVET (*PRIONODON PARDICOLOR* HODGSON).

The beautiful Tiger Civets or Lisangs are now grouped in a sub-division of the tribe—the *Prionodontinae*. They are distinguished from the rest of the Oriental Civets by the absence of scent glands in both sexes, by a characteristic configuration of the genital organs and by the highly specialised character of their teeth. Instead of forty teeth as found in the true civets, they have only thirty-eight. The second upper molar is usually absent or, if present, it is rudimentary. The teeth are sharp and compressed. They indicate that the diet of these animals is carnivorous. They probably feed to some extent on insects also. Their feet differ from those of the Palm Civets (*Paradoxurus* and *Paguma*) in the hairiness of the areas round the pads, and, in this particular, they resemble the true civets (*Viverra*). Their claws are sheathed and therefore completely retractile.

In the absence of scent glands, in the posterior position of the external genitals, in the hairy soled feet and sharp retractile claws, the Tiger Civets show a remarkable combination of feline characters. Even the teeth with their trenchant blades and in their numerical reduction foreshadow the characteristic dentition of cats. Nevertheless the long slender muzzled skull, bodily form and the arrangement of the pads of the feet of the Lisangs essentially class them as civets.

Two species are known. The Spotted Tiger Civet (*Prionodon pardicolor*) and the Banded Tiger Civet (*P. lisang*). Both animals are graceful and delicate in build, sinuous and slender in body, long in the muzzle and very long in the tail. The striking colouration has suggested the name Tiger Civet. The band-like markings of one and the spots of the other differentiate the two species externally.

The Spotted Tiger Civet (*P. pardicolor*) inhabits Nepal, Sikhim, Assam and extends its distribution into Upper Burma and Indo-China. The general colouring ranges from dusky brown to bright buff. The markings consist of two long stripes extending from behind the ears to the shoulders or beyond and of a stripe on each side of the neck. Along the back there are usually two rows of small spinal spots which may coalesce posteriorly to form a stripe. The central row of body markings is flanked on either side with three or four rows of large spots which cover the shoulders, flanks and thighs. The fore legs are spotted to the paws; the hind legs to the thighs, and the tail has about nine complete rings. Animals from Nepal and Sikhim, are distinguished by their darker colouring and generally bolder pattern. The spots are large and symmetrically arranged. They are regarded as representing the typical race which intergrades with

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The Spotted Tiger Civet (*Prionodon pardicolor* Hodgson).

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the more easterly form, *P. pardicolor persina*, which is generally lighter in hue and has smaller, more oval, less lineally arranged spots.

The Banded Lisang (*P. lisang*) is found in Tenasserim, and the Malay Peninsula, Sumatra, Java, Borneo. It possibly extends its range northwards into Siam. In this species the spots on the body are fused to form six broad longitudinal bands.

The Spotted Tiger Civet hunts in trees or on the ground. It lives and breeds in hollows of decayed trees and preys on small birds and animals. The time of breeding is said to be between February and August and the litter to consist of two young—there being two litters in each year. A tame specimen kept by Hodgson was 'wonderfully docile and tractable, very sensitive to cold and very fond of being petted'. It was fed on raw meat and refused fish or eggs. It was perfectly free from odour.

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Sub-family: 4. *ARCTOGALIDINAE.*

The Small-toothed Palm Civets.

THE WHITE-EARED PALM CIVET (*ARCTOGALIDIA LEUCOTIS* BLYTH).

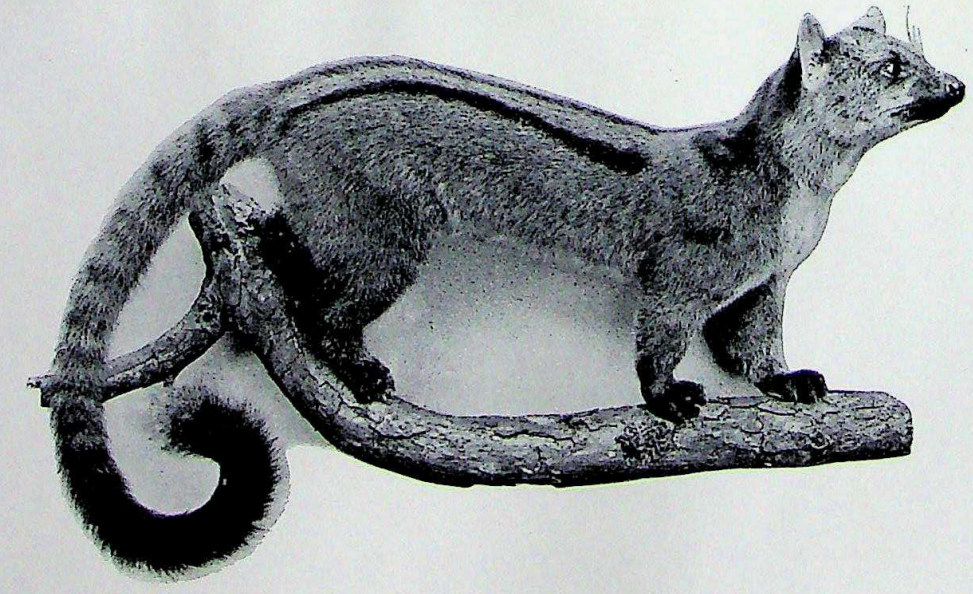
The Small-toothed Palm Civets (*Arctogalidia*) are now recognised as representing a small distinctive group or sub-family.

Externally they are distinguished from all other civets by the absence of perfume glands in the male, which has no naked glandular area in front of the scrotum. In the female the gland is represented externally by two low ridges of naked skin capable of being folded over in front of the generative orifice and continuous behind on each side with the naked area which surrounds it. The feet of these civets resemble those of the Paradoxures except that the pads of the third and fourth digits of the hind foot are not fused and the carpal or wrist pads of the fore feet are relatively longer. The surface of all the foot pads is smooth and not granular as in *Paradoxurus*. As implied by the name the small-toothed civets are distinguished by their relatively small cheek teeth.

In bodily form and in length of limb and tail, the small-toothed civets resemble the Common Palm Civet. But the markings when present are different. They are limited at most to three dark bands along the back. These may be continuous or broken up into spots. Two species are known, one of which, the White-eared Palm Civet occurs within our area. It ranges from Assam to Laos, southwards through Burma and Western Siam to Tenasserim, the Mergui Archipelago and the Islands of the North-West Coast of the Malay Peninsula. Within this range three forms are recognised. The typical form, *A. leucotis leucotis* is found in Southern Burma, Arrakan, Western Siam, Tenasserim and the Mergui Archipelago. The general colour of its fur ranges from dusky grey to bright tawny. The terminal portion of the back of the ears is covered more or less with white hair, the head is usually darker, the muzzle, paws and the distal portion of the tail brownish, the underside is usually greyish white or creamy buff. A white or creamy patch is usually distinguishable on the chest. There is a white streak on the nose and lower forehead and three blackish or brownish stripes along the back. They are sometimes traceable on the neck. The median stripe is distinct; the lateral more or less broken up into spots, less defined and sometimes absent. Transverse stripes or rings are more or less discernible on the basal and mid region of the tail. In animals inhabiting Assam the more northerly areas of the range the dorsal stripes are wide, black and all equally conspicuous. They are consigned to a second race (*A. l. millsi*). A third smaller form *A. l. macra* is said to occur in Dome Island and possibly in the small islands of the north-west coast of the Malay Peninsula.

The second species *A. trivirgata* ranges from Peninsular Siam to Borneo. In this species the ears not parti-coloured the whole

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The White-eared Palm Civet.
Arctogalidia leucotis Blyth.

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outer surface of the ear is clothed with black hairs and the skin is similarly pigmented.

The White-eared Palm Civet is thoroughly arboreal in habit, numbers of them were shot on trees round Tenasserim village. The stomach of one contained the remains of squirrels. Though no doubt partly frugivorous, all the Palm Civets in the Tenasserim area live largely on squirrels and they are a considerable factor in keeping down the numbers of these animals, which are so destructive in the coconut plantations.

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Sub-family: 5. *HEMIGALINAE.*

The Hemigales.

THE BANDED PALM CIVET (*HEMIGALUS DERBYANUS*).

The Hemigales resemble the true civets (*Viverrinae*) in having scent glands which are present in both sexes. They are less elaborate 'consisting of an elongated pouch with thickened hairy labia situated a little in front of the scrotum in the male, but not extending as far as the base of the penis. In the female the scent glands are situated near the anus and in the vicinity of the vagina. The feet of the Hemigales are intermediate in structure between those of the digitigrade *Viverrinae* and the plantigrade *Paradoxurinae*.

Three genera are included in this group one of which, i.e., the Banded Palm Civet (*Hemigalus derbyanus*) occurs in our area only in Tenasserim from whence its range extends through the Malay Peninsula to Sumatra and Borneo.

The animal is about the size of a Common Palm Civet. It has short close fur of a buffy grey colour. The general colouring of the body is largely determined by the colour of the under-wool and the extent to which it is exposed or covered by the longer hairs. The colour of the under-wool ranges from varying shades of buff to bright orange buff, the longer hairs except on the bands are partly whitish, greyish or buffy. The markings are very distinctive. A longitudinal stripe runs from each ear backwards to meet a broad transverse band across the shoulder. Behind these are four or five broad transverse black stripes on the back, the tail is also banded with black. The dorsal bands are very variable in shape and width and in the extent to which they break up on the flanks.

The species is by no means common. It is said to have absolutely no smell—it is very active and probably largely arboreal. A specimen caught alive was very savage and growled like a wild cat.

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FAMILY: III. *MUNGOTIDAE*: MUNGOOSES.

The Mungooses are usually classified as one of the primary sub-divisions of the Civet Tribe. Pocock in a recent study of the group finds a number of positive and negative characters in these animals which he considers sufficient to differentiate them from the Civets and give them the status of a distinct tribe or family. Among the characters which distinguish Mungooses from Civets is the complete absence of perfume glands in both sexes. The absence of these glands in the Mungoose results in a distinctive configuration of the external genital organs. Differences are also seen in the structure of the feet and the ears.

With the exception of one African genus, the ears of mungooses are more or less semicircular in shape and so small that their upper margins do not project above the head or the nape. The structure of the external ear reveals a series of complicated folds which can be shut down one over the other so as to completely close its cavity. This development is not seen in the Civets, animals usually living on the ground or in trees. Mungooses on the other hand frequently live in burrows of their own making, and the complicated mechanism for closing the cavity of the ear is believed to be a special development for excluding dust or dirt when burrowing.

The feet of mungooses are armed with comparatively long or very long claws. They are better developed in the fore feet. The terminal joints of the toes are not provided with ligaments for raising the claws off the ground, nor are the claws furnished with protective sheaths of skin and hence they are always bared. The feet of mungooses however display a wide range of variation. In the standard pattern of foot possessed by many genera, including our Common Mungoose (*Herpestes*), there are 5 toes. The four main digits are well developed but those which correspond to the thumb and the big toe are small, and in some African species these digits disappear altogether, either in the hind foot alone, or both in the hind and fore feet. The four main toes are united with webs—the presence, or the depth of the webs vary in different species. The soles are naked from the central pads to the toes—but the extent to which the area of the heel is covered with hair again varies even in species of the same genus.

Mungooses have no perfume glands—but all of them without exception have anal glands. The secretion of these glands is exuded into a sac or pouch from small openings on each side of or above the anus. The pouch itself surrounds and encloses the anal opening and might be mistaken for an enlarged anus. It is very large and conspicuous in such big species as the Stripe-necked Mungoose. It is less well developed in others and hardly noticeable in the small species of mungooses. The secretion of the anal glands is liquid, foul smelling and often copious. Mungooses have a habit of rubbing the glandular sac against objects in their path; hence it is inferred that one of the purposes of the glands is to leave behind a trail of scent and so familiarize the mungoose with

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every yard of its surroundings. It so becomes independent of vision and can find its way with precision over any road over which it has once travelled. Again many species of mungooses hunt in packs or family parties and such a trail of scent would help individuals to keep together. Finally one species, i.e. the Crab-eating Mungoose (*Herpestes urva*) is known to project or squirt the aqueous, horribly fetid contents of its anal sac to a great distance. It appears that this species at least makes use of the secretion as a means of defence. How far this habit is common to all Mungooses is not known.

The true Mungooses, those forming the genus *Herpestes*, are well known and familiar animals. They have long weasel-like bodies, and a more or less elongated tail bristling with long hairs. The longer hairs of the body are generally marked with alternate light and dark rings, which give a characteristic speckled or grizzled appearance to the fur. The head has a pointed muzzle with a rather short nose and the middle line of the upper lip is usually grooved. The object of this groove, which is seen in most Mungooses and in other carnivores is to help in the separation of the two halves of the upper lip when raised to clear the teeth. When the groove is obliterated the snout has to be raised to draw the lips away to bare the teeth.

Mungooses have a wide distribution ranging over the greater part of Africa, extending across the Straits of Gibraltar into Spain. Eastwards they are found through Southern Asia as far as the Islands of the Malay region. Of the many genera known, all, but one, are confined to Africa or Madagascar. The only genus found within our limits is *Herpestes* which includes the typical Mungooses. With the exception of the *Susicata* of South Africa —all the genera are incuded in a single sub-family *Herpestinae.*

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The Common Mungoose (*Herpestes edwardsi* Geoff.).

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Sub-family: *HERPESTINAE.*

THE COMMON MUNGOOSE (*HERPESTES EDWARDSI* GEOFF.).

The Common Indian Mungoose is found throughout the Peninsula of India from the Himalayas to Cape Comorin. It is said to occur in Assam, but it has not been observed in Burma. The Mungoose found in Ceylon is now considered a distinct species.

This species is so common and so frequently exhibited by itinerant snake-charmers, that it is familiar to all. The pattern of its somewhat long ragged fur is a coarse grizzle produced by the alternate dark and light rings on the hairs. The darker rings on the hairs may be almost black, or grey or some shade of brown, while the lighter rings are more or less white. The grizzling on the face, hands and feet is usually very fine; very coarse on the back and usually less obvious or absent on the under parts.

Various geographical races of the Common Mungoose are recognised and differentiated externally by the colouring of the face and feet, of the longer hairs of the body and the shorter under fur. The Common Mungoose (*H. edwardsi ferrugineus*) of Sind, Baluchistan and the more arid parts of the Northern Punjab, is so named because of the ruddy or ferruginous appearance of its head, feet and the tip of its tail. In the typical form (*H. e. edwardsi*) which is found in Nepal, Upper Bengal and Central India—the rusty colouring of these parts is much less pronounced. The annulations of the longer hairs are alternately brown and dirty white, and the under fur is sparse. Then there is a pale silvery coloured form, *H. e. pallens* which is found all over Rajputana. In this race the whole colouring is much lighter—a whitish silvery grey speckled with light brown, and the under fur is very dense and pure white. In the Common Mungoose of the Central Provinces and the Berars, *H. e. moerens*—the ferruginous wash on the face and feet is absent, the grizzling of the hairs is very pronounced, the black rings on the hairs contrasting strongly with the white; the under fur is creamy. In the South Indian race, *H. e. carnaticus*, which is found in Canara, Mysore, Coorg, the general colouring is dark steel grey, finely speckled with deep brown, giving the impression of a relatively dark coloured animal, the under fur is buff.

The Common Mungoose reaches a total length of nearly 3 ft. of which about 18 in. is tail. The average weight is about 3 lbs. Males are considerably larger and heavier than females.

The Mungoose lives in forest areas but is much commoner in cultivated country. It takes shelter under rocks and bushes, or digs a hole for itself in the ground, or uses the maze-like interior of a deserted termite mound, or a hole in the lower part of a tree trunk, or finds suitable shelter in the rafters of a house. Its food is varied. It preys upon rats and mice, snakes, lizards, frogs, insects, scorpions, centipedes, in brief on any creature that it can overcome and kill. It feeds on bird eggs and to a limited extent on vegetable matter. It will eat carrion and is frequently seen

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feeding on the kills of larger carnivores. It hunts by day and, when accustomed to Man, pays little regard to his presence. But in sipte of excessive inquisitiveness, the mungoose is usually a wary creature, seldom straying far from cover. It can be very destructive, its destructiveness not being limited by its appetite. In a hen house or pigeon coop, a mungoose may achieve wholesale slaughter. Its prowess in killing snakes, rats and other vermin has earned the mungoose a world-wide reputation and has been the reason for its introduction into many countries—not always with the happiest of results. Many and remarkable are the descriptions of encounters between mungooses and snakes. Much has also been written about the supposed immunity of the mungoose to the poison of snakes. The prevalent belief throughout Oriental countries is that a mungoose when bitten seeks as an antidote a herb or root known in India as *Mangus wail* and on eating it, is rid of any harmful effects of snake poisoning. There is no truth in this belief. It is true that the mungoose is less sensitive to the venom and is able to withstand relatively large doses of poison, but its immunity is by no means absolute. A mungoose well and truly bitten and injected with venom sufficient to bring about its death will die like any other animal. All that can be said for it is, that in common with certain warm-blooded animals, like the pig or the hedgehog, it shows a certain resistance to the action of the venom. Cats for instance are less affected by it than dogs and pigs to a lesser extent than cats. Extreme agility in evading a bite gives the mungoose victory over the snake. When the snake strikes, the mungoose generally leaps aside to avoid the thrust and before the snake can recover to strike again, the animal rushes in, seizes and crushes its head with its sharp teeth. Other factors which avert an issue fatal to the mungoose are its tough skin which must be resistant to anything but a direct thrust and its habit of bristling the hairs of its body and tail under stress of excitement. It is suggested that with the hairs standing erect a mungoose looks twice as large as it really is and this must sometimes cause the snake to strike short.

Mungooses breed all the year round. The period of gestation is about sixty days. Three litters may be produced in a single year. A female kept in a semi-domesticated condition in Cannanore, South India, produced a litter of two in May, a second in September, a third in December and a fourth in June of the following year. The mother was in the habit of bringing her babies down from the roof when she came for her food. She climbed as well as a cat and was seen to jump a vertical height of over 4 ft. with a ten-days old baby in her mouth. When the young were able to follow her, she took them out on foraging expeditions. They kept close to her side, stopping when she stopped. The Common Mungoose is frequently seen hunting in couples or in family parties, the mother and the young are sometimes accompanied by a male.

The Mungoose makes a charming and docile pet. It is quite cleanly in its habit and has none of that unpleasant odour one usually finds in wild animals.

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The Small Indian Mungoose (*Herpestes auropunctatus* Hodgs.).

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THE SMALL INDIAN MUNGOOSE (*HERPESTES AUROPUNCTATUS* HODGS.).

The Small Indian Mungoose is easily distinguished from the Common Mungoose by its small size and shorter and closer fur. It is restricted to the northern portion of India and is found along the lower slopes of the Himalayas from Sikhim to Kashmir and then across the plains from Baluchistan, Sind and the Punjab to Bengal. Southwards its range extends into Rajputana, Gwalior, Gujerat and Kathiawar.

The Small Mungoose is from 18 to 22 in. in total length. Its general colouring ranges from a speckled greyish to golden yellow or to brown. The form found in Baluchistan and Sind, known as *H. a. pallipes*, is distinguished by its pale grey colouring. *H. a. helvus* which is found in Kathiawar, Gujerat and Gwalior is a more yellow in general colour. The forehead is a deep yellow buff—the feet light yellow, the underside paler and the general colour yellow grey minutely speckled with brown. In the typical form found along the Himalayas and in Behar and Bengal, the general colouring is brown, minutely speckled with yellow. In Assam, Manipur and Burma, the Indian species is replaced by another form known as the Small Burmese Mungoose (*H. birmanicus*) which is still darker in colouring and markedly larger in size. Reference must also be made to a third species described under the name of *H. nipalensis*, distinguished from *H. auropunctatus* by the much finer grizzling and generally darker colouration of its coat. It has been taken at a level of 7,000 ft. in Nepal and in Midnapur in Bengal. It is a rare and little known species.

The Small Mungoose lives and breeds in holes apparently burrowed by itself. It is diurnal in habit and is seen about bushes, hedges and cultivated fields. It is a cautious creature generally keeping to cover. Its presence can usually be detected by the worn tracks it leaves along hedges. It feeds on anything that it can kill, on rats and mice, snakes, scorpions, centipedes, wasps and insects of all kinds—as such, like its larger relative it is useful in ridding a house of vermin. Like the Common Mungoose it makes a useful and charming pet but is apparently less certain in temper. A tame female kept in a semi-wild state paired with a wild male on the 4th of July and on the night of the 23rd August after a period of seven weeks produced a litter of three young—one male and two females. Her second litter of two, both females was produced on the 14th April and on the 9th July she produced two more, both females. The newly-born young are described as being remarkably ugly, practically hairless and of a dark mouse colour. The eyes opened on the 16th-17th day after birth. When suckling they purred like a cat. The mother gave vent to a purring sound whenever she was given a drink of milk. She was most restless and for the first two or three weeks would constantly move her offspring from place to place carrying them as a cat carries her kitten. While her young were helpless she was very savage in their defence.

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THE RUDDY MUNGOOSE (*HERPESTES SMITHII* GRAY).

The Ruddy Mungoose is a species which is mainly restricted to forest areas. Its range extends from Rajputana, Central and Western India, southward to Ceylon. The species attains a length of approximately 3 ft. of which 1 ft. 6 in. is tail.

The general colouring of the animal is a iron grey, produced by the white, grey and brown rings of its hairs which are tipped with rusty brown. The head and legs are washed with reddish brown and the feet are almost black. This species is easily distinguished from the Common Mungoose by the black tip to its tail. There is however a wide range of variation in colouring which has led to the recognition of six more or less distinct geographical races. The typical form is found in Central and Western India from Hoshangabad southwards to the Nilgiris. The general colour is dark with less rufous, the legs are not conspicuously reddish though the ankles often are. The form found in North-East Rajputana, *H. s. rusanus*, is similar to the typical race in colouring but it is a small animal representing the extreme in the gradual reduction in size from south to north. A third race, *H. s. caneus*, is described from Mount Abu, South-West Rajputana—the general colouring is a clear grizzled grey without the brownish or rufous characteristic of the other races. The form found in the Eastern Ghats, *H. s. jerdoni*, is drabbish grey. The Ceylon form, *H. s. zeylanicus*, is the largest and most richly coloured of all—the whole colouring being richly rufous.

In Mount Abu this species is fairly common. It lives in burrows and shelters among rocks. Family parties have been observed hunting by day. Its food is probably similar to that of other mungooses. Being a creature of forest area it is less commonly observed and nothing is recorded about its breeding habits.

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THE NILGIRI BROWN MUNGOOSE (*HERPESTES FUSCUS* WATERHOUSE).

The Nilgiri Brown Mungoose is restricted to the hill forests of the Nilgiris, Palnis, Travancore and Coorg and possibly other hill ranges of South-Western India.

It is a large heavily-built blackish brown mungoose more or less speckled with yellow or brownish white. The paws are almost black. The under fur is brown—the longer hairs of the body have alternate rings of blackish brown and yellow or yellowish white, three or four of each, the darker rings are much wider than the light. The head and body of this mungoose measure about 19 in., the tail 12 in.; the weight of a male is about 6 lbs.

This mungoose is fairly common in the coffee plantations. Nothing has been recorded about its breeding habits.

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THE STRIPE-NECKED MUNGOOSE (*HERPESTES VITTICOLLIS* BENNETT).

This Stripe-necked Mungoose, the largest of all Asiatic Mungooses, is found in the hill ranges of South-Western India, from Kanara southward to Ceylon. It is a very handsome creature with an iron grey head, the body speckled with brown, yellow and red. On the lower part of the back and tail there is a profusion of long chestnut hairs. A very distinctive black stripe marks each side of the neck. The end of the tail is black. In life the shape of the head differs from that of the Common Mungoose (*H. edwardsi*), the snout having a slightly upward curve. This mungoose grows to over 3 ft. in length and weighs about 7 lbs.

This species is common all over the Nilgiri and Palni plateaux and is equally abundant in the swamps and rice fields of the Wynaad. Unlike other Indian mungooses it appears to be less plentiful in the neighbourhood of human habitations. Large and powerfully built, these mungooses can be very destructive to game —they hunt a good deal by day and are seen prowling about frequently in couples—presumably following their quarry by scent and then burrowing for it in the ground. These large mungooses have extraordinary tough skins and with their wiry hair are almost proof against dog bites.

Nothing is known about their breeding habits.

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The Stripe-necked Mungoose (*Herpestes vitticollis*, Bennett).

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THE CRAB-EATING MUNGOOSE (*HERPESTES URVA* HODGSON).

The Crab-eating Mungoose is found at low elevations in the South-Eastern Himalayas, in Assam. Its range extends into Burma, Tenasserim and Southern China.

Like the Stripe-necked Mungoose it is a large and powerfully built creature. The general colouring of its coarse and ragged fur is a dusky iron grey with a greyish surface caused by the long whitish tips to the hairs. A well marked, narrow white stripe runs along each side of the neck from the angle of the mouth to the shoulder. The head is dark brown speckled with white, the legs are similar in colour, but there is no white speckling on the feet. They are usually black. In this species the soles of the hind feet are naked only for about two-thirds of their length, the heel area being covered with hair. The woolly under fur is dark brown at the base then pale brownish yellow. The dimensions of this mungoose are as follows:—Head and body 18-21 in., tail without hair at the end 10-12 in. Unlike other species, the Crab-eating Mungoose is mainly aquatic. It lives on the banks of rivers and streams and preys mainly on frogs, crabs and fishes. A specimen was shot on the Chindwin River while burrowing in a bank. In Kurseong one of these mungooses came repeatedly to a tank stocked with Gold Fish—it took many of the fish and must have dived from the tank side to procure them.

Nothing is known of its breeding habits.

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FAMILY: IV. *HYAENIDAE*: HYAENAS.

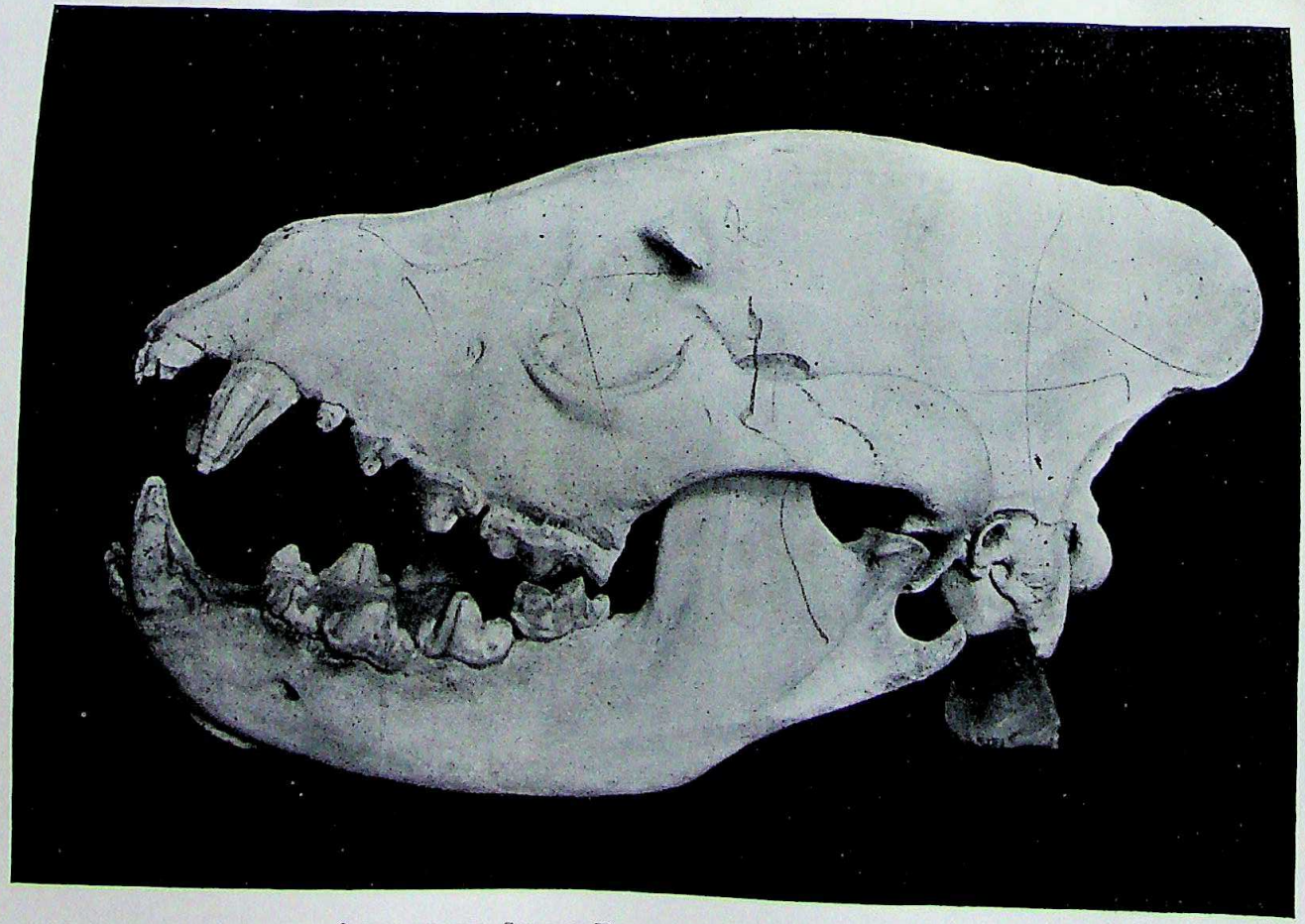
Hyaenas resemble dogs rather than cats in external build, and may be easily taken for members of the Dog-tribe. Structural details of the skull and the character of the teeth however definitely place the Hyaenas within the Aeluroid or Cat Section of the Carnivores.

The closest relatives of the Hyaenas are believed to be the Civets and Mungooses. Some authors trace a particular affinity between hyaenas and mungooses—both groups of animals having certain points of structure in common. The relationship between hyaenas and civets and their kindred is not very apparent in existing species, but it is more strikingly revealed in the structure of extinct forms which lived during past geological epochs. In the lower part of the Pliocene there occurs an interesting civet-like animal known as the Ictithere which in its structure serves to reveal a close alliance between these two families of Carnivores.

During past epochs, hyaenas inhabited the greater part of Europe and ranged in Asia as far east as China. Fossil species are numerous. No less than 5 different species have been found in the Siwalik fossil beds of the Punjab. One of these extinct forms from Northern India, in the length of its jaws and in the form and number of its teeth makes a close approach to the civets. The teeth of the present day hyaenas are in some respects feline in character and differ in these points from the teeth of civets. A hyaena has 34 teeth in its jaws, a cat 30 and a civet usually 44. The numerical difference in the teeth of cats and hyaenas is accounted for by the retention in the Hyaena of an additional premolar tooth, on each side of both in the upper and lower jaws. A hyaena has 4 premolars and 1 molar on each side in its upper jaw, and 3 premolars and 1 molar in the lower. As in Cats, the molar, the last tooth in a hyaena's upper jaw is reduced to a minute tooth. All the cheek teeth in the lower jaw are conical teeth with sharp cutting blades. But the distinctiveness of the Hyaena's dentition is seen in the great size and strength of the cheek teeth as compared with the canines; more specially in the massive conical crowns of the second and third premolars in both jaws. These teeth carry a strongly pronounced basal ridge which acts as a shield for protecting the gums. This form of tooth is especially designed for gnawing and breaking bones. The teeth and jaws of hyaenas have assumed those characters which adapt them for their peculiar food and habits. The Hyaena is a scavenger. It feeds on the bones and the coarser remains left over by beasts of prey. The whole skull has its shape modified by the enormous development of the muscles which work the jaws and teeth. Few Carnivores have jaws and teeth which can compare in strength or bone crushing power with those of hyaenas.

The Hyaena is a massively built animal with broad short head and a deep body. Its legs are comparatively long—particularly the fore limbs, so that the hind quarters droop. The massive

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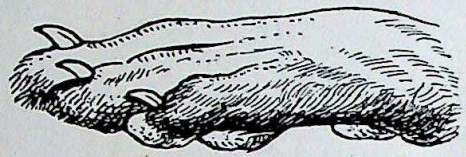


SKULL OF THE STRIPED HYAENA (*Hyaena hyaena* Linn.).

Few Carnivores have jaws and teeth which can compare in strength and bone crushing power with those of hyaenas.

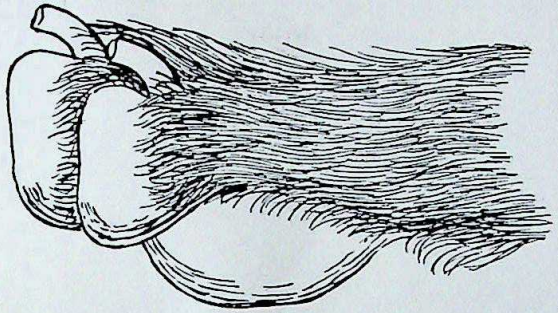
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1

Fig. 1.—Left forefoot of the Large Civet (*Viverra zibetha*).



2

Fig. 2.—Right hindfoot of Common Hyaena (*Hyaena hyaena*).

Note the shape and vertical plane of the toe-pads which are uptilted in the Hyaena's foot; the general character of its foot is dog-like and distinct as such from the feet of Cats and Civets.

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build of the fore part of the body as compared with the hind, and its knock-kneed hind legs gives the hyaena an awkward, hang-dog appearance. The hair is coarse and shaggy. The thickness of the coat, the colour and the boldness of the markings appear to vary with season.

A hyaena has only 4 toes on its fore and hind feet, the digits corresponding to the thumb and the big toe are absent. The claws are short and blunt, they are unprotected with sheaths and are non-retractile. The feet differ in some respects from the feet of cats or civets. The pads under the toes show several peculiarities. The bases of the toe pads are set at right angles to the central or the plantar pad of the sole. Again the pads are not elliptical but more or less conical in shape. In the uptilting of the toe pads, in their rigidity, compactness, and shape as well as in the short blunt claws the feet of hyaenas resemble those of dogs. The toe pads of cats and civets are usually elliptical in form, and their bases lie in the same plane as the plantar pads of the sole. Hyaenas have anal glands which exude their secretion into a pouch. The presence of an anal pouch in hyaenas and mungooses is cited as part of the evidence of affinity between these two animals. But Pocock has indicated the considerable difference between the anal pouches in the two groups. In mungooses the anus opens in the centre of the anal pouch and the margins of the pouch close right over the anus, also the orifices of the glands are situated tolerably near the anus. In the hyaenas on the other hand, the opening of the pouch appears as a curved slit over the anus, the orifice of the glands are far removed from it.

The existing species of hyaenas are three in number. All of them are included in the genus *Hyaena*. Only one species the Striped Hyaena is found within our limits and extends its range into Africa. The Brown Hyaena (*H. brunceus*) and the Spotted Hyaena (*H. crocuta*) are now limited to Africa. Fossil remains of the Spotted Hyaena have been excavated from some caves near Kurnool in the Madras Presidency, indicating the past existence of this species in India.

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THE STRIPED HYAENA (*HYAENA HYAENA* LINN.).

The Striped Hyaena is found throughout the Peninsula of India. It is not found in Ceylon nor in the countries to the east of the Bay of Bengal. In the west its range extends through South-Western Asia into East and North-West Africa. During and before the age of the Mammoth, the Striped Hyaena inhabited a considerable part of Europe. Its bones have been discovered in a cave in the south of France, and teeth of this species have been found in England.

The colour and markings of the hyaena vary considerably with season. Much depends on whether the animal is in fresh coat or has shed its hairs or whether it is in its fuller winter coat. Various races of this animal have been described without any account being taken of these factors. Linnaeus originally gave the name *hyaena* to a hyaena from South Persia. The Persian animal is believed to be similar to the Indian, but if the Indian form is proved to be distinct, it will carry the name *H. h. indica* Blainville.

The Indian Hyaena does not develop a very long winter coat; but it is full, much fuller than the hot weather coat and comparatively soft. The colouring is cream or buffy white and the head tawny buff—the whole colour tone changes to grey or dirty white in the harsher and scantier summer coat. The transverse stripes fade from black to brown—they may be less evident in the fuller winter coat or again tend to become obliterated in cases where the subsequent shedding of the hairs leave the flanks of the animal almost bare.

The Striped Hyaena stands about 3 ft. high at the shoulders—the head and body of a male measures a little over 3½ ft. and the tail with terminal hairs is about 1½ ft. in length. A good-sized female may scale 75 lbs.—the male is about 10 lbs. heavier. Hyaenas are more common in the drier parts of India—particularly among rocky hills or nullahs—or by the outskirts of jungles in the plains. They are found in the open areas of the Nilgiris around and above Ootacamund at elevations ranging from 3,000 to 8,000 ft. They usually shelter in caves, or among boulders. and frequently make a den in an enlarged porcupine's earth. Hyaenas are nocturnal in habit coming out in quest of food about sunset and retiring before sunrise. They usually go about in pairs —parties of five or six have been seen together, but this is unusual with this species. They are great wanderers and their tracks are quite common. The foot print is much like that of a dog—except that the print of the fore foot is much larger than the hind. The pug is easily differentiated from that of a panther by the print of the claws.

The hyaena is mainly a scavenger, and as such performs a useful task. It feeds on the carcases of animals that have died of disease or been killed by other beasts of prey. The carcase is eaten where it lies but portions of it may be carried off into the animal's den. Hyaenas sometimes kill and carry off sheep and

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The Striped Hyaena (*Hyaena hyaena* Linn).

Photo by F. W. Champion.

Tree of Dill... ...ne People's Park) ...

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goats. They are particularly partial to dogs. They do not usually attack larger cattle. There is a record of two cows, tied up as a bait for tiger being killed by a hyaena. The stomachs of the animals were ripped open and they were literally eaten into when yet alive. It is recorded that this species is far more aggressive in Africa than it is in India and that, in Abyssinia, Striped Hyaenas have developed a habit of killing sheep and goats and frequently run amock in a flock killing a dozen or more animals. Fortunately in India our hyaena can in no sense be considered aggressive, despite its bulk and power, it does not attack larger animals, though individuals may be quite prepared, if need be, to appropriate and dispute the kills of panthers or even tigers. There are several instances on record of hyaenas depriving panthers of their kills and of routing them in disputes.

While hunger may give the hyaena inordinate courage, when brought to bay, it does not show fight. Dunbar Brander states it will frequently sham death when harried by a pack of dogs, submitting passively to the direst worrying and ill-treatment.

Though not usually very demonstrative hyaenas give vent to various weird noises, a common sound is a loud laughing chatter.

Little is known about the breeding habits of hyaenas, it is recorded that in the Central Provinces they breed during the cold weather and that the young are generally born in the hot weather —5-6 being produced in a litter.

When taken young, hyaenas are easily tamed and make very affectionate and docile pets.

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THE PRESERVATION OF WILD LIFE IN INDIA.
No. 7. THE MADRAS PRESIDENCY.

BY

R. D. RICHMOND, I.F.S. (*retd.*).

Provisions for the Protection of Wild Life.

In a consideration of the preservation of the fauna of the Madras Presidency it is to be remembered that here, as in the rest of British India, the State owns large areas which have been constituted Reserved Forests and which, *if properly administered* in this regard, form permanent abodes for game and other animals. All possible types of country are represented and all the larger animals, with the exception of the antelopes, are thus provided with *potential* sanctuaries. The habitat of the antelope is for the most part the plains and open fields, but there are certain areas of reserved forest in which they are able to, and do, take refuge.

The area under the control of the Forest Department is some 16,000 sq. miles. Under the Forest Act simple trespass is an offence and shooting is not permitted except on license, the grant of which is governed by close conditions. Game protection *is a definite duty* of the forest staff and even if the charges are large (the average of a divisional charge is over 500 sq. miles of forest and that of a beat, the smallest division is 10 sq. miles) the machinery for protection exists.

Thus the fauna is provided with somewhere to live permanently and an organization to protect it, even if the personnel of that organization is small and sometimes neglectful of this particular item of its duties. But while there can be no chance of the 16,000 sq. miles of Reserved Forest being appreciably reduced there is a danger of comparatively small areas essentially the habitat, or within dangerous proximity of the habitat of particular species e.g. the Nilgiri Tahr and the gaur, being alienated and to guard against this a second line of defence has been devised, such areas being declared to be game preserves. The whole 16,000 sq. miles is of course a game preserve, but the whole of it is not *essential* to the preservation of the fauna and, where certain species would find themselves unduly restricted by the alienation of the country they exist in, special steps have been taken to preserve it as public property. Although any area may at any time be closed permanently, or temporarily, to the shooting of all animals, or any particular animal, the policy is not to form preserves of considerable area, in which nothing may be shot, as it is considered that one of the best methods of controlling poaching lies in the presence of licensed sportsmen. Shooting is closely regulated in theory at least; though a license to cover a year's shooting, except in two areas where the shooting

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is controlled by specially formed associations, may be obtained for the very small sum of 15 shillings. The number of head of each kind which may be shot is prescribed, as is the size of head, the sitting up over water holes or in machans is forbidden and modern tendencies have been guarded against by the prohibition of shooting from motor cars or with artificial light, except in the case of carnivores. Certain animals other than those preserved for sport and which were becoming scarce e.g. the Malabar squirrel and the black monkey are specially protected, while the shooting of game and other birds is regulated to some extent. Orders exist prohibiting the grazing of cattle in areas specially assigned to the gaur, this step being taken to save them from contact with rinderpest. The grant of rewards for the destruction of wild dogs has been resumed.

While the closest attention is paid to certain classes who will not ordinarily infringe the rules, it is to be feared that the Indian license-holder, few of whom shoot for sports' sake, who pays little attention to the conditions of his license, and who will entrust his gun to other parties, is poorly controlled. And of recent years the policy has been to grant licenses to possess arms to a greater and greater extent, and any one with a gun who lives within reach of areas containing game, is a potential poacher. Also a class of license, that for crop protection, is responsible for considerable damage; damage which might be mitigated would those responsible consent to the peasant being put to the inconvenience of depositing his arm with the police at times when there are no crops to protect. A further handicap to game conservation is the extremely rapid Indianization of the Forest Service: officers of the new class take at present little or no interest in natural history, or in the preservation of wild life and, as a rule, other activities prevent them from paying sufficient attention to a part of their duties with which they are in little personal sympathy. The difficulty is that there is no public opinion on the subject of game preservation in the country and until this has been created, little will be accomplished. The jungleman is principally poacher, for food or to obtain meat for sale.

The Status of Wild Life.

In the Godavari, where the gaur is probably on the increase, chital and sambur are not as numerous as they were: much of the damage, strangely enough, being done with the bow and arrow. For very many years there has been little game in the Ganjam district, so little in fact that the balance of nature is upset and the district is principally notorious for man-eating tigers. The populated north of the vast tract of Vizagapatam and Jeypore, which is a native state, has little game left in it, but the sparsely populated south is well off for all kinds and is the only place in the Madras Presidency where the buffalo is found. Very little of these areas are Reserved forests. The Eastern Ghats are of little interest, except for chinkara at the foothills and some antelope on the plains. The 2,000 sq. miles of the

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Nallamalai hills contain plenty of game of all kinds and it is strange that the gaur does not occur. What are known as the Ceded Districts contain very little at the present day. Once the haunt of the elephant, forest destruction preceding cultivation, and accelerated by the goat, has had the inevitable result of driving the game away as well as of reducing parts of the country almost to the condition of desert. There are however, still antelope and chinkara, while sambur are to be found on the hills of Cuddapah and Chittoor; in fact there is still plenty of game in the latter district, even if the glory of the Chamla Valley has departed—due to fewer Europeans visiting it. The Javadi and Salem hills contain gaur which are closely protected and which do some damage to forest works, but the rest of the game animals are poorly represented. The same may be said of the Madura District, principally interesting from the fact that a herd of gaur was cut off when the railway was constructed and, well protected, have persisted. The Palni hills of Madura provide representative animals on the slopes, the Nilgiri goat (*Hemitragus hylocrius*) on the edges of the plateau (7,000 ft.), while the gaur occasionally visits the plateau. But protection is none too good in spite of a constituted game association. Tinnevelly is moderately well off and here too the Nilgiri goat is to be found, though the numbers have decreased considerably. The forest area of South Coimbatore is famous for the 'Grassy Hills', on the borders of the Cochin State, at an elevation of 6,000-8,000 ft.; the Nilgiri goat being common, while elephant and gaur are to be found on the open grass. This forest division contains, in one particular part, the white bison which appears to be developing into a distinct variety.

The North Coimbatore and Kollegal divisions have perhaps suffered more than most, including, as they do, so many villages, from the increase of poaching; but other and perhaps temporary factors are at work, if anything is to be inferred from the varying incidence of the number of game animals in a certain locality. Reported in 1893 as denuded of game, once very common, the old state of affairs was restored from 1901 onwards while there is now again complaint of scarcity. Elephants have increased to an inconvenient extent in numbers of recent years.

The forests of Malabar, that is to say the protected areas, for there are very considerable tracts of private forest land in which there is no protection or shooting regulation, are for the most part exceedingly well stocked with game and other animals of all kinds, particularly elephant and gaur—the forest areas belonging to Government are more compact than elsewhere and there is far less population inside them and on their edges—consequently there is less poaching.

To judge by the complaints of damage done by wild animals it would be supposed that South Kanara teemed with wild life; but such is far from being the case, the complaints being in reinforcement of agitation for the abolition of the forests. But in the upper hills there are sambur and there are a few gaur—also elephants. The tiger, accused of killing great numbers of domesti-

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cated cattle (and it is a fact that the mortality of cattle from wild animals is greater here than elsewhere) is in fact rare, the delinquent being the panther, living in low rocky hills distant from the real forests, and killing cattle as there is nothing else to live on.

The Nilgiris, a district at elevations from 1,000-8,000 ft., is richer in fauna of all kinds than any other. Naturally well endowed in this respect, protection in the last forty or fifty years has been good on the whole. The shooting is regulated by a Game Association, the members of which are those who take out annual shooting licenses—these are mostly Europeans—and a special protective staff is entertained. The Nilgiri Tahr, its habitat is the Nilgiris (north of which the family is unrepresented until the tahr is found in the Himalayas), Madura, parts of Malabar, Cochin, Travancore and Tinnevelly in the extreme south, has definitely increased of recent years; sambur abound on the plateau (a beneficial practice is now permitted in the shooting of a limited number of hinds), gaur, vulnerable to epidemics of rinderpest from time to time, chital and sambur are common on the slopes and lower plateau, muntjac are exceedingly common, as are also elephants. Tigers are commonly found on the upper plateau. The extension of the planting industry has reduced the area available, but there is still plenty of room and, whereas certain animals may appear to be reduced in numbers from time to time in different places, there seems to be no ground for apprehension that game animals are decreasing. A falling off in the number of sambur stags shot by license-holders by no means justifies the belief that this deer is becoming more scarce—the fact is that there are fewer warrantable stags to shoot for the reason that the best have been shot year after year.

Recommendations.

There is no need to apprehend that the fauna of Madras is decreasing to a dangerous extent *at present*, though it would be idle to pretend that there are not forces at work which should be guarded against. Apathy on the part of a new class of officer, who is not interested in sport or natural history, and the increased facility with which arms may be legally possessed may both be corrected. Public opinion may in course of time be developed, though this will necessarily be a slow process and it will be fatal if the impression is formed that the interests of the cultivator will not be protected. There is ample room for the wild animals in the considerable areas of forest land which is the property of the state and which need never be alienated, all that is required is the determination to make protection effective. 'Preserves', in this Presidency at all events, appear to be uncalled for—the whole of the forest area is a 'preserve'—and the regulations permit of certain parts being closed to shooting either permanently or temporarily. 'National Parks', if by these are meant areas which are specially protected and in which no shooting by the public is allowed, but which are maintained so that the public may see

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and study the habits of wild animals, are on a different footing. These should be of great general interest and educational value and tend to promote that public opinion which is so desirable. A difficulty in connection with these 'National Parks', however, is their location; they should be near areas of considerable population, and be served by roads; also the forest should be of a type which allows of the animals being easily seen. It is perhaps sometimes overlooked that conditions in different countries vary and that what may be suitable in Africa, for example, is inappropriate in Madras.

It will not be easy to find an area which fulfils all the essentials; a considerable sum of money will ultimately be required and it cannot be expected that National Parks will be self-supporting; but the first steps are being taken and it may be hoped that they will bear fruit.

Suggestions are from time to time heard as to the desirability of establishing a separate game department under a Warden. Those who advance this view possibly have the conditions of Africa in mind; in India there is already an organisation one of the duties of which is to protect the animals as in the case of the other contents of the forest—the appointment of a Warden, and some additional staff, would lead to dual control and friction: nor is there any need for it. Properly controlled and supported, with some strengthening in certain places, the ordinary staff of the Forest Department *should* be well able to do what is required.

But the Department requires greater support. It is essential that the authority responsible for the issue of licenses under the Arms Act should consult the forest authorities on applications in respect of residents in, or near, the forest; that guns concerned in shooting offences be confiscated, that the Magistracy should attach greater importance to offences of this class and it is extremely desirable that the sale of flesh at certain seasons should be declared illegal. Finally it is anomalous that the head of the Forest Department should, in theory, be unconcerned with this branch of the work of his department, at present in the hands of an authority which has no occasion to go into the forests and which is not in any way concerned with other branches of forest administration.

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COMMENTS ON Mr. RICHMOND'S NOTE.

BY

R. C. Morris.

In the note on the 'Game Preservation in the Madras Presidency' it is mentioned that there is an area of 16,000 sq. miles providing a natural Sanctuary for the fauna with the Forest Department as an organisation to protect it, the protection of game being a definite duty of the Forest staff.

This may be said to apply to nearly every country holding forests with a Forest Department to control the same. Although in theory the machinery for protection exists, and shooting is regulated, in practice it has been found, and I fear always will be found, that Game Protection is relegated to the background as Forest Officers find that the whole of their time is taken up by other work, in other words the preservation of the fauna takes a back seat to the protection of the flora. That the Forest Department have failed to afford the necessary protection for the fauna cannot be gainsaid, nor can Forest Officers be expected to devote the required amount of time to Game Preservation, however interested they might be in the matter, and I am sorry to say that in many cases these days there is little interest.

It is mentioned that areas denuded of game in 1893 were restored to the old state of affairs from 1901 onwards. I think it would be more correct to have said 'denuded of chital' instead of game. I am fairly sure that the author had before him a note written by a Collector in 1893, and if I remember rightly this only referred to chital in a particular area.

I do not agree with the opinion that there is no cause for apprehension that the fauna of the Madras Presidency is decreasing to a dangerous extent. This statement covers the whole of the fauna and I consider that chital, black buck and chinkara have certainly decreased to a dangerous extent and will be extinct in South India not many years hence unless steps are taken in the matter. The Nilgai in South India have already gone the same way.

I entirely disagree with the opinion that the appointment of a Game Warden and special staff for the control of a National Park, Game Sanctuary for the fauna in the Ordinary Reserves is unnecessary, nor can I see how the present staff of the Forest Department will be in any better position to control the fauna, still less a National Park or Game Sanctuary, than it has been in the past. I cannot see how any friction could arise if the Chief Conservator of Forests controlled both the Forest and Game Departments, the Game Warden if required being a Forest Officer specially seconded for this purpose as was the case in Burma. To my mind it is quite certain that a Game Department would

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improve matters considerably whether a National Park was established or not, and if any doubt exists on this point a visit to Ceylon might be made to compare the condition of game in areas under the control of the Game Association or Game Department in Ceylon with that in the areas controlled only by the Forest Department.

I do agree with the author in his opinion that the present dual control in connection with shooting licenses should cease. Shooting licenses should be issued by the District Forest Officers (on behalf of the Collectors). Further no arms licenses should be issued by District Magistrates to people living near Reserved or Unreserved forests without the District Forest Officers being consulted in the matter: more important still Magistrates should be made to take a far more serious view of poaching offences and offences under the Arms Act (illegal possession of guns) than they do at present. Punishments meted out to poachers are ridiculous: an inveterate poacher is not worried at all at the prospect of serving two or three months' imprisonment occasionally.

The status of Wild Life in the Madras Presidency may be put shortly as follows:—

1. (*a*) *Within Government Forests.*

In one or two districts, take Ganjam for example, there is little or no game left. In other districts a few species exist thinly scattered, and *in parts* of the districts of Coimbatore, Malabar, Madura and South Kanara game, with the exception of chital and antelope, is still fairly plentiful. The reason is not far to seek. These districts hold areas which *have been* difficult of access to the poacher and here game still holds its own. Chital and antelope live in country that is easily poached and unless early measures are taken chital, black buck and chinkara will be exterminated in South India not very many years hence, just as the Nilgai have been. I say that certain areas 'have been' inaccessible to poachers as with modern guns and cheap electric torches the present day poacher is a far more dangerous enemy to game than he was in the past. Poachers are now penetrating into parts they have never been into before, and it is a certainty that in course of time no part of the jungle will be free from the poachers' activities. Take for example the Billigirirangans. Were it not for the presence of Planters residing on the hills to put a curb on poaching sambhur on the hills would be exterminated. At the northern end of the hills, in the Kollegal Division far from these Estates, very few sambhur are left, most of them have been shot out by the Sholagas who hold guns (some time back 14 guns were seized in one day ,but the Sholagas hold just as many now). In the Mysore part of the hills very few sambhur eixst although the area is known as the Chamarajnagar Game Sanctuary. What applies here also applies to other districts with the exception of the Nilgiris where the Nilgiri Game Association run a fairly good show. In the more accessible tracts of the Coimbatore, Malabar, Madura and South Kanara districts the status of Wild Life is parlous in the extreme.

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The new experimental measure for the compulsory inoculation of village cattle in the Kollegal and North Coimbatore Divisions should keep bison comparatively free from rinderpest, and it is a measure that I should like to see carried out in other districts where biosn occur.

(*b*) *Outside Government Forests.*

Very little game exists, and the remnant is rapidly vanishing.

2. (*a*) *The species of animals for the protection of which there is a special urgency.*

Chital, black buck, chinkara, 4-horned antelope and, in some parts, sambhur.

(*b*) *Animals which do not require vigorous protection but need a modified form of protection.*

Bison only should be placed in this category.

Legislation.

3. *The effectiveness of the laws at present in force in various Provinces which regulate the killing or trapping of Wild Life in Government Forests. Proposals for their improvement where necessary, particularly in regard to the use of motor cars, dazzle light, nets and pits.*

The present laws in force in the Madras Presidency would be very effective if properly enforced. Suggested improvements are:

(1) Considerable moderation in the issue of gun licenses, especially in areas adjacent to reserved or unreserved forests; (2) the necessity of Magistrates consulting District Forest Officers on all applications for arms licenses when the applicants reside within poachable distance of reserved or unreserved forests; (3) the necessity for far more severe and deterrent punishments on offenders convicted under the Forest Laws and the Arms Act; (4) the necessity for District Forest Officers to treat the subject of Game Preservation as one of their most important duties; (5) stricter rules in regard to the use of motor cars for shooting. It is suggested that the Governments concerned should prohibit the shooting of large or small game within 100 to 200 yards of any public road.

There is already a rule against shooting any animals except the carnivores with a torchlight, and I do not think this can be improved upon if enforced properly.

The stricter enforcement of the laws against netting and pitting, both of which are carried on in out-of-the-way parts (instances have been reported recently), and the prohibition of either netting or pitting in *unreserved* forests.

4. *The control of slaughter of Wild Life outside Government Forests.*

This is a more difficult matter, and I am not sure whether Government have any legal right to put forward measures for the control of slaughter in private lands. This is probably a case of educating the landowners on the matter.

5. *Legislation controlling sale of hides, horns, etc.*

In the Madras Presidency I do not think there is any legislation in force at present prohibiting the marketing of flesh, hides

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and horns of game animals either in close season or out and such legislation should be enacted at a very early date. A law against the export of plumage exists; and legislation prohibiting the marketing of all parts of game animals throughout the year is very necessary.

Under the heading of legislation I should like to see the Indian chevrotain or Mouse Deer added to the list of animals completely protected, and the use of a shot gun (buck shot) on all deer and antelope should be prohibited.

In Coimbatore a slip is now added to all shooting licenses asking the licensees to look for and report to the District Forest Officer of the Division in which they are shooting all cases of poachers' machans on trees, or hides on the ground, over water and salt-licks which they may come across and this should be made one of the clauses in the Rules attached to shooting licenses. If Government could be persuaded to agree to the immediate dismissal of any Forest Guard in whose beat an illicit hide or machan is found the would-be poacher would receive a tremendous knock, as no Forest Guard is going to risk losing his job to help a poacher whatever inducement the latter may offer him.

ADMINISTRATION.

6. (*a*) *The desirability of definitely laying on the Forest Department the duty of preserving the Fauna and Flora (and not merely trees) in the areas in their charge; (b) the desirability of creating a distinct organisation within the Forest Department for the protection of wild animals within Government Forests.*

I consider it is definitely desirable to create a special department, to be controlled by the Chief Conservator of Forests, for the protection of wild animals within Government Reserved and Unreserved Forests. The control of both the Forest and Game Departments by the Chief Conservator of the Province should remove most causes of friction that may otherwise occur between the two Departments, whether the Game Warden is a seconded Forest Officer or not. However much District Forest Officers are encouraged to treat Game Preservation in the proper light this interest is bound to fade again in course of time and will only be kept alive by the existence of a Game Department with which the Forest Officers will have to co-operate in full. The existence of a Game Department is bound to improve matters whether National Parks or Game Sanctuaries are established or not.

7. *The formation of National Parks or in the alternative of strict Nature Reserves where possible, and* 8. *The question of making separate financial provision or the creation of a special fund for carrying out the work of conservation.*

If the formation of a National Park in the Madras Presidency is considered unfeasible, I do not think the necessity for a separate financial provision will arise as a Game Department would presumably be financed under an increased Forest Budget; but for the creation of a National Park or Game Sanctuaries separate financial provision would be required. Two areas do

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exist in the Madras Presidency which could be turned into National Parks provided communications are improved, and here the value of having the Chief Conservator of Forests as the head of both Departments will be seen, as in one of the areas the improvement of communications will assist considerably in the extraction of forest produce. In this case the term 'National Park' will not be correct as forest work will be carried on in that area, and it would be a Game Sanctuary, but in either category the control of the fauna in this area should fall on a Game Department, and would have to have a special staff in permanent control special funds for financing the work being drawn from the most obvious sources, i.e., the revenue derived from:—

(1) Game licenses;
(2) Licenses and permits for sporting arms;
(3) Import and export licenses for the above arms;
(4) Duty on sporting arms and cartridges;
(5) Licenses to sell or store sporting arms and cartridges;
(6) Fishing licenses;
(7) Fines and penalties for infringement of shooting rules;
(8) Fines imposed for offences connected with poaching etc;
(9) Sales of confiscated and picked up trophies and parts of game animals and birds (both game and protected).

The other area is I consider eminently suitable for the formation of a National Park and should be self-supporting in course of time.

GENERAL.

9. *The position of the Cultivator in relation to Wild Life and the provision which might be made for the protection of human life and property in the neighbourhood of forests from the ravages of wild beasts.*

The damage done by wild beasts, *other than elephants*, is very much exaggerated. Elephants do a lot of damage, in fact unless early measures are taken to deal with the elephant menace it will be, and has been in the last few years, an intolerable hardship on the cultivator whose lands are adjacent to or surrounded by forests in which elephants occur. It is suggested that one of the best methods to meet the elephant problem is the appointment of three or four salaried men to shoot the leading offending bulls at the time crops are being raided. I say 'bulls' as bulls are generally the chief offenders, they play havoc with the crops, either solitaries, in pairs, or as leaders of herds. The experience in Africa has been, on a few of their leaders being shot, elephants soon recognise raiding crops to be an unhealthy pastime. It is only during the harvest season, or for a month before, that the damage from elephant occurs. Ivory from elephants shot would be handed over to Government and should cover the salaries paid out. A strong fence round fields will keep out most of the other animals that matter. The protection of human life hardly comes into the question as regards the cultivated areas of the Madras Presidency, except it be from elephants, and here again the shooting of solitary tuskers has long been advocated being as often

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as not potential rogues, and nowadays many of them are wounded by the muzzle-loading and cheap breech-loading guns of the Ryots in cultivation. Solitaries which are not necessary for the propagation of the species, generally hard to tame if captured, often frequenting public roads and bridle paths, are a terror to travellers, and sooner or later an accident occurs. I have said 'tuskers' as mucknas are not generally vicious, being usually of a docile temperament.

One of the most important aspects of bird protection should be kept well to the fore: the necessity of showing the cultivator where he does wrong in killing out many of the species of birds found on his land, and for this purpose an ecological bird survey should be made of every province which will prove of immense value in demonstrating the birds that are the friends and the enemies of the cultivator.

10. *Measures to restrict the possession or use of weapons which may be used for poaching.*

A great curb to poaching would be the recall of all guns issued for the purpose of crop protection; immediately harvesting is over, the issue of weapons to applicants must be cutrailed: this is very important.

Rewards should be offered, *and paid out promptly*, for information leading to the seizure of illicit guns, *and action taken to recover the weapons immediately information is received.* What frequently happens is this: A Sub-Inspector of Police receives information that an illicit gun is to be found (either in a hut, a grain pit, a hay-stack or more frequently in a watchman's shelter on a tree). Instead of prompt action being taken days elapse before *constables* are sent to recover the weapon and in the meantime it has been removed. To my knowledge this has occurred time and again, the informers get no reward or compensation for their trouble, and so give no further information in regard to any other weapons they may get to know of. The same delay has been experienced over Range Officers taking action when illicit machans and hides are reported, even when instructed to proceed immediately to the spot by their District Forest Officers. A few days are allowed to elapse before action is taken, in the meantime the poachers get wind of the matter and the machans or hides are removed.

A Forest Guard should be immediately dismissed if a poaching case in his beat is not reported by him. It is suggested that a Monegar, Village Munsiff, or Village Headman should be heavily fined if a case of illicit possession of arms is discovered in his village or villages under his jurisdiction. There is not the slightest doubt that every Village Munsiff or Headman knows exactly what arms there are in the village or villages under his jurisdiction, whether licensed or unlicensed.

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No. 8. HYDERĀBĀD STATE.

BY

SALIM ALI.

The Hyderābād State occupies an area of about 82,000 sq. miles of the Deccan Plateau. Its north-eastern boundary adjoins the Chanda District of the Central Provinces, renowned among sportsmen of the last century as an ideal game country. Hyderābād State at one time, not so very long ago, provided some of the finest big game shooting—especially tiger—in India, and even at the present day inspite of the penetration and colonization of vast tracts of forest land and the consequent depletion of wild life, there still exist in the Dominions parts which are in no wise inferior to the best that can be found elsewhere within the Indian Empire. Some idea of the abundance of tigers in the last century can be obtained from the fact that the famous shikari Col. Nightingale (who died at Bolarum in 1868) alone killed during his service over 300 tigers, the majority of which were in Hyderābād territory.[1]

Status of Wild Life.

The wild life of Hyderābād is as varied as it is interesting. Tigers are still comparatively numerous in the forests of the Eastern and Western Circles, which also contain some gaur. Leopards and sloth bears are fairly plentiful; sambhur, cheetal, muntjac, four-horned antelope, nilgai, black buck, chinkara, hyaenas, wild dogs, jackals and wild pig are found in suitable localities, while there still remain a few cheetahs or hunting-leopards and wolves. Besides these, porcupines and many other species of smaller mammals are found. A few buffalo are said to occur in the Eturnagaram Range of the Mūlūg Talūka (Warangal District) but their numbers are very small. The shooting of buffalo and gaur has been totally prohibited for some years past, owing to which they have, for the time being, been saved from extinction.

In his *Reminiscences of Sport in India* (published 1885) Major-General E. F. Burton mentions a herd of twelve wild elephants near 'Percall' Lake in 1847, which were said to be descendants of animals that had broken loose in the wars about 200 years previously. In 1866 this herd had increased to fourteen or fifteen individuals. Nothing is known as to what became of them until the 1909 edition of the *Imperial Gazetteer*, which stated that there was one single female still left in those parts. Despite the above, however, Nawab Hāmid Yār Jung Bahādūr, the Inspector-General

[1] It is of interest to note that since this article was written, the heir-apparent Prince Āzam Jah Bahādūr, and partly recently (*ca.* May 1935) in the course of 33 days shooting killed 35 tigers, in addition to bears, sambhur and other game in the preserves of Pākhāl, Mūlūg and elsewhere.

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of Forests, informs me that no elephants in a wild state have been heard of in Parkal Taluka within the memory of the oldest man living.

Provision for Protection of Wild Life.

Up to the year 1897 or thereabouts, there were apparently no restrictions in Hyderābād against tiger or any other shooting. The present Game Regulations came into force from 28 September 1914. For the purpose of their application, the Dominions are divided into four circles which include both reserved and open forests. They also include Jāgīr and Samastān forests as well as the private Game Preserves or *Shikārgāhs* of His Exalted Highness the Nizām. The Pāigāh Nobles, who have extensive estates (the largest being that of Nawab Moin-ud-dowla Bahādūr which covers an area of 1,287 sq. miles) the owners of Samastāns, and the Jāgīrdārs manage their own forests and are entitled to regulate shooting on their private domains. The rules relating to close seasons, shooting of does and immature animals, and the restriction against shooting buffalo, guar and hunting-leopards are, however, applicable to them. Theoretically speaking, therefore, no shooting can be done in the State without either a license from the Government or a permit from the Pāigāh Nobles, Samastān-owners or Jāgīrdārs concerned.

According to the Game Regulations only one circle is thrown open for shooting each year from 1 March to 31 May and again for ten days at Christmas. For black buck the open season is 1 December to 31 May. Only half the number of districts comprising such circles are open at a time, and shooting areas in these open districts are also defined. Certain areas are thrown open and others closed to tiger shooting from time to time depending upon the increase or decrease of these animals.

Forest Areas.

The most important game forests at present are:

Eastern Circle.

1. Warangal.
2. Khammam.
3. Karimnagar.
4. Nizāmābād.

Western Circle.

1. Asifābād (formerly known as Jangāon).
2. Nīrmal.
3. Mahbūbnagar.

In addition to the above, the forests of Garlāh Jāgīr and Pāloncha Samastān contain big game.

The three principal *Shikārgāhs* of H. E. H. the Nizām are:

1. Pākhāl, situated in the Pākhāl and Mahbūbābād Talūkas of Warangal District and managed by the Forest Department under whom there is a special *Mūntazim* or Warden and a staff of watchers. Area 345.75 sq. miles.

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2. Saroonagar, and
3. Alampalli both situated in the Atrāf-e-Balda District and managed by a special establishment under the Sadrūl Mohām, Sarf-e-khās Mūbārak.

The Pākhāl Preserve contains mostly all the big game animals of the State, while the other two which are in open scrub country, have chiefly black buck, hare, partridge and quail.

The *Shikārgāhs* are governed by special rules sanctioned by the Nizām. The Pākhāl *shikārgāh* was abolished some years ago which led to a rapid felling and bringing under cultivation of some of the jungles, with a corresponding diminution of wild life. About four years ago the preserve was re-established. Though for all practical purposes the area is a sanctuary (H. E. H. himself is not keen on shooting, and the two elder princes generally shoot there only about once a year or so) it is doubtful whether with the exception, perhaps, of tiger, the reservation contains as much game as may be expected. The game-watchers that I came across when on ornithological survey work in this part of the country struck me—most of them—as thoroughly inefficient, and information supplied by them, wherever it could be tested, proved unreliable in nine cases out of ten. From my experience of these men (unfortunately the *Mūntazim* himself had died just a few days before my coming to Pākhāl) it is not inconceivable that a good deal of poaching is tolerated by them, either actively or through indifference or neglect. A proper enquiry alone can show if at the present time game is really in any better position here than elsewhere in the State forests, if indeed as much. Col. R. W. Burton informs me that in connection with the visit of a Viceroy in 1902 or thereabouts, Mr. Hankin, the then Inspector-General of Police, and Mr. Biscoe, Conservator of Forests, went through the Pākhāl country on purpose to see what game there was. They told him afterwards that they had seen *no* 'animal', and only one peafowl!

Depletion of Game Animals.

Inspite of the measures promulgated for the protection and preservation of the fauna, which theoretically speaking should give adequate protection to the existing species, Hyderābād unfortunately is no longer the prolific game country it was during the last century, and even during the past thirty years there has been a steady and perceptible diminution. The chief causes of the decline will be analysed later; in the meantime it is interesting to collate the present conditions with whatever little information we can gather concerning the recent past. In the middle of last century the country between Hingoli and Bōkar (Nāndēr District, Western Circle) was famous for tiger and Col. Nightingale shot many of his animals there. In two seasons (March-April) 1897 and 1899, Brigadier-General R. G. Burton of the then Hyderābād Contingent, killed twenty-six tigers in Sirpūr-Tandūr, mostly round Jangāon—the present Āsifābād. On his last visit to this district in 1899 he still found tigers as numerous as ever, and heard fifteen years later that they were just as abundant.

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He always thought there was a great breeding-ground of tigers in the stretch of Hyderābād territory south of the Peinganga River in the Bēla and Rājūra talukas of the Sirpūr-Tandūr District and sees no reason why it should not now be as full of tiger as it was thirty-five years ago. Whatever the reason, those conversant with modern conditions in Hyderābād will agree that this is unfortunately not the case. The Ajanta Range all along the Khāndēsh border north of Aurangābād to Kannad was also famous for tiger in the early part of the last century, but now merely harbours occasional stragglers.

There were a few herds of gaur in Sirpūr-Tandūr in the 1890's. One whole herd was reported to have perished from foot-and-mouth disease at Mānikgarh. These animals are now very scarce, and though I often heard of their occurrence, I actually saw only one pair at Utnoor, and from the footmarks I came across in that part of the country they were obviously rare. Inspite, however, of the total prohibition of the killing of these bovines, I came across more persons than one who boastfully claimed to have shot them in recent years!

As regards cheetal, General Burton says: 'In days when cheetal were in vast numbers in the Kinwat (now I think called the Peinganga Reserve) there were scarcely any in adjoining Hyderābād territory across the river. The same with regard to antelope of which there were vast herds in Berār, but few over the Nizām's border.' It appears therefore that the mischief had already made good progress by the time of which General Burton writes.

Jerdon, in the first quarter of the last century, referred to herds of thousands of black buck in the country around Jālna. According to Col. R. W. Burton there were in 1897-1903 black buck and chinkara along the railway line between Secunderābād and Manmād, but fast being wiped out. In 1892 he saw herds of many hundred black buck when marching through the country. In 1903 these herds had dwindled to a dozen to twenty, not more. Though still fairly plentiful in some of the remoter parts of the Mahrattwāda districts, black buck are fast disappearing with the advance of colonisation and increasing facilities of swift transport, coupled with a complete disregard on the part of the man with the gun for age, sex or season. Herds of more than a few individuals are now uncommon, and heads of any decent size difficult to find.

General Burton says that in 1895-1899 there was plenty of feathered game in Hyderābād—Grey and Painted Partridge and Sandgrouse. This is now in a particularly bad way and needs speedy and drastic measures to restore it to anything like its former abundance.

My work in connection with the recent Hyderābād Ornithological Survey (1931-32) took me to many parts of the country once famous for game, and I made a point of investigating as far as possible into the present state of affairs. On the whole, it seemed to me that compared with accounts of even as recently as thirty years ago, the condition is distinctly poor, and this con-

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clusion has since been confirmed by the State Inspector-General of Forests. It is true that tigers are still plentiful in certain portions of the Godāvari Forest Belt, but a rapid diminution in their numbers is inevitable if the present attitude of apathy is persisted in and things allowed to drift as now. Moving about the country as a non-official outsider, I had many opportunities of entering into conversation with people in every walk of life from whom much useful information could be gleaned concerning the subject. Moreover, once their initial suspicion was allayed and they perceived that my interest was chiefly confined to collecting birds, they came out with a good deal more about their exploits with the larger game animals than it would have been possible to extract by direct cross-examination. All I had usually to do was to lead them up to a point and leave them to damn themselves! Even after due allowance for bravado and for shikari's tales, the magnitude of the wanton destruction of life that goes on everywhere, was manifest.

What struck me as curious was that inspite of the formalities and obstacles in the way of getting shooting licenses and the limits of bags, as prescribed under the Regulations,[1] almost every man possessing a gun boasted of the number of tiger, sambhur, cheetal, often gaur and other game he had shot and was still continuing to shoot! The more discoursive ones could, with sufficient encouragement, usually be made to reveal the objectionable methods they employed, which they often did not unmixed with a certain measure of pride in their achievements. In the course of my wanderings in the forest at Nelipāka (in the Pāloncha Samastān), Amrābād, Ūtnoor and elsewhere, I constantly came upon machāns built on trees or pits dug round the edges of swamps or pools in nullah-beds, etc., from whose concealment these relentless gunners slaughtered every animal that came to drink, regardless of the season or whether it was male, female or young. The pity of it is that in many cases this destruction is made possible not only by a passive connivance of the petty officials who have a share in the spoils, but often with their direct abetment. A petty police, revenue or forest official who hears guns popping off almost every night close to his village even in seasons when there are no crops to justify them, can usually be induced to 'keep the peace' if he receives a leg of venison as hush-money. I say this with first-hand knowledge, and it is a fact known well enough to many of the higher officials with whom I had occasion to discuss the question, but who are powerless to put a stop to the practice under prevailing conditions. Sambhur and cheetal are perhaps the worst sufferers, and in areas where they were plentiful as recently as 10 years ago, a marked decline in their numbers is noticeable.

It is sad, but nevertheless true, that some of the greatest offenders are not the ignorant ryot and the village shikari, but directly or indirectly they are people like vakils, officials (usually, but not always, petty!) and well-to-do and so-called educated

[1] Clause 21 even says 'application from non-officials will be entertained but this I understand is now obsolete,

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citizens who should know better. They either do the slaughtering themselves, regardless of Regulations and time of year, or lend out their guns to professional shikaris, or encourage the latter indirectly by commissioning them to procure game for them or by readily buying up whatever is offered for sale at all times of the year.

This indirect sort of abetment is not confined to four-footed game, but applies largely also to game birds such as partridge and quail. While on survey work on the outskirts of Aurangabad town in the second half of April (1932), I came upon a party of professional snarers complete with paraphernalia and decoy birds. Investigation showed that these men had been commissioned to catch bush-quails for a dinner being given the next day by a military 'Burra Saheb' of the British Cantonments! These professional snarers—Pardis and others—are veritable pests, but it is only thus that they are able to carry on their nefarious operations year in, year out, with the result that in many areas feathered game has been reduced to the verge of extinction. In the words of a highly-placed police officer who was also a keen sportsman and Nature-lover and strived at all times to ensure an observance of the Game Regulations, 'The man with the gun does not do half so much damage (to feathered game) as the snarer. He is like a broom, for he sweeps everything before him into his net.'

Principal Reasons for Depletion of Game.

Some of the causes contributory to the rapid and steady depletion of wild life in the Hyderābād State have been hinted at above. Many of them are the same as obtaining in other parts of India, but there are others which are peculiar to the Dominions and the direct outcome of conditions there prevailing. To tabulate them all, they are as follows:

1. Enormous and continued increase of population in the last two decades as shown by the Census Reports of 1921 and 1931.

2. Improvement, extension and opening up of new roads and railway lines (cf. the Kazipet-Belharsha line and others) and the introduction and penetration of motor cars and buses, which combined with (1), are having the effect of throwing open large tracts of country that hitherto provided a refuge to wild life.

3. The facilities provided by (2) in bringing distant game tracts within speedy and comfortable reach of the man with the gun.

I remember that in October 1925, just after the monsoon, it took me three days by bullock-cart to reach Ūtnoor from Nīrmal. There was no road most of the way and the journey had to be done over cart tracks little better than boulder-strewn ravines, and through swollen streams with rocky beds and steep muddy banks in which the wheels sank to the axle-trees. It was an experience not to be repeated in a hurry, however keen a shikari one might be. With the opening up of the Hatnūr-Ūtnoor road, off the main Nīrmal-Ādilābād road, the same journey was per-

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formed in 1932 by motor car in about as many hours! As Ūtnoor lies in the midst of some of the finest shooting country, the effect of this innovation on game can be imagined.

In the exploits of veteran shikaris of the 1890's, like General Burton, one constantly comes across names of places in the State like Jangāon (now Āsifābād) which it took him days of riding or marching to reach, and with an infinite amount of bandobast for his kit. The place is now accessible by rail and bus within a fraction of the time, and with no more bandobast than the purchasing of one's ticket!

4. Shooting from motor cars and buses both by day and by night is a growing menace. The practice has assumed alarming proportions since the Game Regulations were promulgated in 1914, and since it is apparently not contrary to law, it is freely indulged in by all and sundry.

5. The non-existence hitherto of the Arms Act and the easy availability of cheap guns of foreign and local manufacture, and of gunpowder and percussion caps for muzzle-loaders.

6. Indiscriminate poaching and slaughter of game for commercial purposes at all times of the year.

7. Wholesale snaring, netting and trapping of game birds such as partridge and quail, often at all seasons, and the taking of their eggs.

8. Droughts and epidemics.

9. Wild Dogs.

Remedies Suggested.

1, 2, 3. Increase of population, clearance of forest lands, extension of cultivation and of transport facilities are the natural concomitant of progress, and it would be unreasonable to check these, except perhaps (1), for which suggestions are out of place here! No case can be made out for protection of wild life at the expense of human interests. However, a strict observance of the Game Regulations in such areas should be enforced and punishments of a deterrent nature meted out to offenders uniformly, regardless of rank or social position.

4. Shooting from cars and buses, especially by night with the aid of powerful headlights and electric torches, should be made unlawful.

5. The recent introduction of the Arms Act into the State has not been a day too early. The restriction it will impose on the possession of firearms and on the purchase of ammunition, gunpowder and percussion caps should, if properly enforced, have a beneficial effect on wild life in course of time.

6 and 7. It is a fact that most of the poaching—slaughtering and snaring—is done for monetary gain and is encouraged directly or indirectly by people who have no excuse for pleading ignorance of the law. It is an axiom that if there were no receivers of stolen property there would be no thefts committed which, in the main, is unassailable. Therefore, if the promiscuous *purchase* of the meat, hides and horns of game animals (except perhaps of game birds in season under a regulated system) was made illegal,

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as well as the *sale* of these articles, the chief incentive to poaching would be eliminated and a great deal of professional poaching would disappear. I suggest that as regards partridge and quail, areas should be set apart in rotation to remain entirely closed to *snaring* and *trapping* at all seasons, until such time as they become sufficiently replenished. The taking of eggs of all game birds should be made punishable.

8. *Droughts* can be remedied to some extent by the provision of reservoirs and by means of canals and channels leading from them. This has already been partly achieved in certain areas, cf. Pākhāl and Nizāmsāgar Lakes, and others. In times of drought, such places tend to draw round them animals from distant parts and, wherever possible, adequate forest land should be set apart near such reservoirs to provide harbourage to wild life at ordinary times, and specially in seasons of water famine.

Epidemics.

According to the Inspector-General of Forests, no epidemics among wild animals are reported, and no measures are taken to protect game in the forest against them. That measures are called for, however, is patent; an instance has been given above of a whole herd of bison being exterminated by foot-and-mouth disease near Mānikgarh and the late Mr. E. Ogilvie, a District Superintendent of Police, informed me that some years ago hundreds of animals perished in the Warangal District in a similar epidemic.

Large tracts of game country have been known to be cleared by rinderpest and foot-and-mouth disease contracted from infected cattle left to graze in forests inhabited by wild animals. Measures should be enforced that as soon as the first signs of an outbreak of these epidemics are detected in village cattle, they should be prevented from being let loose in Government forests containing game. One epidemic of this sort, as is well known, will do damage from which it will be difficult for game to regain its position for years afterwards. Often the damage is irreparable, and in many cases the serious diminution, or even complete extinction, of bison and buffalo in certain areas can be traced directly to disease contracted in this way from domestic cattle.

9. *Wild Dogs* do considerable damage to game, and inspite of a recent suggestion that their ravages have been over-estimated, it cannot be denied that measures devised to reduce their numbers in certain other Indian States and Provinces resulted manifestly in a corresponding increase of such animals as sambhur and cheetal which are their favourite prey. It may be a fact that they actually drive away more game than they kill, but it is none the less true that they do considerable slaughter. Moreover, the game thus driven out often suffers heavily in an indirect way by being forcibly exposed to other dangers perhaps just as great, if not greater. It may, for instance, be driven from its forest fastnesses to the neighbourhood of villages and cultivation, where it stands a good chance of falling to the gun of the village shikari or poacher, or in the case of young animals, to his dogs.

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When I was at Āsifābād, the surrounding country was overrun by wild dogs, in consequence of which forests said to contain a fair amount of game ordinarily, were bare. I shot a wild dog which was later sent with the shikari to the kutcheri for claiming the prescribed reward. The Tahsildar was wholly unaware of any reward having to be paid! Enquiries of the Inspector-General of Forests elicited that some years ago rewards were paid for killing wild dogs (as per Clause 42 of the Game Regulations) but due to disuse this had become a dead letter and no rewards were now being paid. In my opinion, no case has been made out for the discontinuance of the rewards and the sooner they are re-instated the better.

The existing Game Regulations, with perhaps a few alterations and additions, are sound enough on paper. Their application and enforcement is quite another matter. Mr. Hankin, a former Inspector-General of Police, tried his best during many years, but though a forceful and able officer, it is doubtful if he was able to effect much. Neither have the authorities at the top relaxed their efforts since, but for all practical purposes the position has not improved. In my opinion the immediate way of dealing with the problem as far as the State is concerned, would be to form a small committee comprised of a competent non-official sportsman and naturalist, and Forest, Police and Revenue interests to go into the matter thoroughly and *de novo*, and to investigate the exact present position of wild life from district to district. Having once determined this, and with due regard to the varying conditions, they should be able to devise practicable measures for giving effect to the remedies suggested above and to any others that may seem to them necessary.

There are extensive tracts of forest in the State which might be demarcated and set apart as Wild Life Sanctuaries on the model of the National Parks now in existence in most civilised countries of the West. Three suitable localities suggested by the Inspector-General of Forests for such reservtaion are: (1) along the cart track from Āsifābād to Ūtnoor-Ādilābād District; (2) Amrābād-Mahbūbnagar District; (3) around the newly constructed Nizāmsāgar Lake—Mēdak District. For the administration of these reservations and also for a proper administration of the Game Regulations in other State forests, the need of creating a separate and efficient Game Department becomes imperative. This should consist of a Game Warden with a staff of assistants, and watchers of the right type. It should either be subject to the Inspector-General of Forests and work in full co-operation with his department, or better still be directed by a small committee consisting of the Inspector-General of Forests, the Inspector-General of Police, the Revenue Member and the Game Warden (*ex-officio*). By a curious anachronism, shooting licenses are at present issued by the Political Department. Whatever may have been the origin and desirability of this practice in the past, it is clear that the function should now be transferred to the Forest Department where it rightly belongs. Later it could be taken over by the Game Department. The present procedure has little to recom-

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mend it; it results in unnecessary inconvenience and lack of co-ordination which does not make for efficiency.

After a proper investigation into the problem of wild life conservation in the Nizām's Dominions, as elsewhere, it emerges more clearly than ever that at the back of all the senseless slaughter and law-breaking, which has brought about the present sorry plight, is the apathy of public opinion towards the need for the preservation of our fauna. The backing of public opinion is vital to the success of a campaign of this nature. Lectures and the exhibition of suitable cinema films should be organised in order to rouse the public from its apathy and make it realise the value and importance of wild life, and appreciate the measures and the arguments put forward for its protection and preservation. A beginning must also be made with children in the schools, by means of properly arranged Nature Study programmes, so that they will grow up to a love of Nature Study programmes, so that responsibility for the conservation of wild life which is their natural heritage. Let us hope it will not be too late before the necessary steps are taken by the authorities.

I am indebted for much interesting information concerning game in the Hyderābād State in the recent past to the two veteran sportsmen brothers Brigadier-General R. G. and Col. R. W. Burton, and to Nawāb Hāmid Yār Jung Bahādūr, the State Inspector-General of Forests, for his ready and willing co-operation in supplying me with a great deal of authentic data relating to modern conditions and to the existing Game Regulations and their administration in the Dominions.

DEHRA DUN,

30th September, 1933.

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No. 9. MYSORE.

BY

Major E. G. Phythian-Adams, F.Z.S.

The State of Mysore is an elevated table-land varying in altitude for the most part from 2,500 to 3,000 ft. above sea-level. The Western Ghats rising to some 5,000 ft. bound it on the west and break the force of the South-West Monsoon. On the south are the Nilgiri Hills and on the south-east the Billigirirangans, the highest point of which is about 5,000 ft. above sea-level. In the interior the country is undulating and in many parts hilly. Generally speaking the northern part of the State consists of open plains with occasional rocky hills, the centre is the most intensely cultivated, while on the western and southern fringes are the denser forests. The total area of the State is some 30,000 sq. miles of which forests cover over one-tenth. The forests are divided into: (1) Game Preserves which are closed to all shooting and fishing except by special permission; (2) State forests corresponding to Reserved forests in British India where the pursuit of game is illegal except on licence; and (3) District forests which now hold little but small game, panthers and wild pig.

Mysore is the fortunate possessor of a fauna so diverse and varied that few other parts of India can equal it. The extensive open plains of the north are the home of numerous herds of black buck, which extend more or less over all cultivated areas of the State; the more broken country holds chinkara and wolves, while nilgai though uncommon are still reported to exist in certain parts. The forests contain herds of elephant and bison, and a good herd of sambhur and spotted deer, while lesser fry, barking deer, wild pig, etc. are common in suitable localities. The State contains some famous tiger grounds and panthers are ubiquitous, though hunting leopards are probably now extinct. Bears are fairly common in certain parts and wild dogs even more so. The list of indigenous small game includes the Great Indian Bustard, Florican, Peafowl, Jungle and Spurfowl, Partridge, Sandgrouse (two or more varieties), several species of Quail, Green, Bluerock and Imperial Pigeons, and the Indian Hare, to which must be added in the cold weather countless numbers of Snipe, Duck and Teal and some Bar-headed Geese, which find rich subsistence in the paddy fields and on the irrigation tanks with which the State is so well provided. Apart from game birds Mysore is particularly rich in bird life both resident and migrant, and it is to be hoped that before long a regular scientific survey of it will be carried out as has been already done in other parts of South India.

The principal rivers of the State are the Cauvery and Kabbany, and on the northern border the Tungabhadra, and there are numerous subsidiary streams, all of them holding the snub-nosed

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crocodile and immense numbers of fish: mahseer, carp, murrel, labeo, etc. providing not only excellent sport but also an important item of food supply to the population.

The above short survey will show how varied the Fauna is, and it now remains to compare the past with the present, to consider the Game Laws, and to make any suggestions for further safeguarding an asset of such importance.

For information about wild life in the State in years gone by we are largely dependent on the well-known works of Sanderson and other sportsmen. In those days there were apparently no game preserves and one gathers, no game laws either. Big and small game of all kinds was plentiful and the bags obtained were certainly larger than would be possible now. But already by 1900 a distinct decrease was noticeable for Russell writing in that year remarks that: 'One has only to read old sporting books and even so comparatively recent a one as Mr. Sanderson's and to know the forests as they are at this day, to fully appreciate the terrible rate at which game has decreased and is ever decreasing in Mysore'; and personal enquiries from older residents in the State confirm a great decrease of big game in the District forests, and to a lesser degree in the State forests, though the position in the Game Preserves is less unfavourable.

Due consideration must however be given to the inevitable restrictions imposed on wild life by the opening up of fresh areas to cultivation, the increase of population and consequent increased number of arms licences, and improved communications and means of transport, and if all these are taken into account, it would be unreasonable to consider the present position as unsatisfactory, though certain steps are most desirable to prevent further deterioration.

Elephants which are strictly protected as in British India continue to provide sufficient numbers for the famous kheddahs as and when required. There is no dearth of bison and good heads are still obtainable. Sambhur and spotted deer are still to be found in fair numbers. Black buck which in some parts were certainly in danger of extermination before the War have now largely recovered, thanks to protection. Tigers are as numerous as ever in Shimoga and Bandipur though they appear to have deserted Sanderson's old shooting grounds on the south-eastern border, probably owing to all the deer there having been killed off. Panthers continue to be as much a pest as ever. Wild dogs are certainly not on the decrease in spite of the reward placed on their destruction. Bears seem to have changed their habits to some extent and to have become more nocturnal than in Sanderson's time, but though harder to find they certainly exist in fair numbers. Wolves certainly have decreased, which will not be regretted by sheep owners whose herds used to suffer severely from their depredations. Up to about 1914 a few were shot almost every year close to the capital but a careful search in recent years has failed to discover their existence within many miles of the city. Turning to birds the only resident which has seriously decreased is the Great Indian Bustard. A few pairs

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still exist in favoured localities in the centre of the State, their numbers slightly increasing as one goes north, but at the best there are very few left and their survival if left longer without protection is most unlikely. Great numbers of partridges and junglefowl are snared and sold in the towns throughout the year and this unrestricted slaughter is already having its effect though there is little fear of their extermination at present. Of the migratory birds duck and teal have certainly greatly decreased in numbers during the past ten years but this is a matter hardly within the control of the State authorities though some improvement might be effected in the case of the spotbill duck and whistling teal numbers of which stay to breed locally, were the trade in their eggs made illicit. The shooting of Demoiselle cranes might well be prohibited in certain areas where their pursuit offends the religious prejudices of the inhabitants. Their numbers are so vast that there is little fear of their being seriously reduced, but protection seems desirable for the reason given, as more than one fracas has already occurred in this connection.

So far as is known the only attempt to introduce exotic fauna was the importation of a herd of fallow deer a few years back, but unfortunately the experiment failed as they were quickly killed off by wild dogs. There should however be less difficulty in introducing gooral which could be obtained without much trouble from the lower Himalayas and for which an ideal locality could be found in the isolated Gopalswamibetta hill. Such an addition to the fauna would be of great interest as at present this species is unknown in South India.

The Game Laws of the State were revised in 1931 and on paper serve as a model of their kind. In general they follow those in force in the Nilgiris and other parts of British India, but there are two important clauses which strike a new note in Game Preservation in India, viz.: (1) classification of tigers as 'game' with an annual bag limit of two; and (2) imposing on private owners the necessity for taking out a licence before they can shoot game on their own land. The damage done by tigers is often much exaggerated and the help which they give to the ryot by destroying deer and pig forgotten, and the Mysore Government deserves great credit for its bold step in giving them some form of protection, an example which might well be followed in other parts of India. The clause regarding private lands is of course on the lines in force in Great Britain and as such is a distinct advance, though it might have made clear the inalienable right of the owner to game on private land, a most important point which seems to have been overlooked in other parts of India also, as the private owner can do so much to protect the wild life on his land if educated to do so.

A noticeable omission from the Laws is any clause dealing with that modern pest the motor car shooter. Shooting from cars is indefensible; it is not sport but slaughter, and far too many animals escape to die a lingering death. It has been very rightly banned in East Africa with severe penalties, and recently we understand in the Bombay Presidency and in the Nilgiris, and

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Mysore which justly prides itself on being an advanced State would do well to follow this good example. At present the practice is on the increase, and one hears almost incredible stories of bursts of rapid fire at herds of bison, of animals shot and left to rot by the roadside, and of lorries specially equipped with spotlights for poaching sambhur etc. at night. No shooting should be permitted within 100 yards of a car, and heavy penalties enforced for breach of this rule.

As has been said above, the existing Game Laws are a model of their kind, but as has been found in other parts of India, it is one thing to pass a law and quite another to enforce it. The public generally and many even of the subordinate officials appear to have no knowledge of the existence of these laws, far less of their provisions, and poaching is widespread and largely unchecked. Public opinion is not yet sufficiently educated to realise the importance of the preservation of the fauna, and until the scope and purpose of the Game Laws are more widely known, it cannot be expected that their provisions will be generally observed. Much good would be effected if the subordinate Government officials of all Departments concerned were made to realise their responsibility in the matter, and this applies with particular force to the Forest Range Officers who if they like can put a definite stop to all poaching.

But still more important is the education of public opinion which can best be effected by propaganda in the Press, by lectures and nature classes in schools and colleges, by the formation of local associations for the study and protection of wild life, and by collaboration with similar societies already existing in other parts of India.

Equally important is the creation of a Wild Life Fund to which would be credited all revenue from arms licences, shooting and fishing licence fees, fines for offences, etc. while the Fund would be used to pay rewards for the destruction of vermin, for preventing poaching, and for the upkeep of a Game Warden and National Park. At present there are in the State no sanctuaries for wild life, though to a certain extent the Game Preserves take their place, but a stricter supervision is required if these are to fulfil a really useful purpose. It is suggested that part of the Bandipur Game Preserve might with advantage be turned into a National Park. This area holds a good head of game and wild life generally, and being adjacent to the strictly preserved Mudumalai forest under control of the N.G.A. could be easily policed. Bandipur lies on the main road some 50 miles equidistant from Ootacamund and Mysore City, and a well organised Park there should prove a great attraction. The existing Travellers' Bungalow could be easily enlarged to provide the necessary accommodation.

There is no doubt that the presence of sportsmen in shooting areas is one of the greatest curbs on the activities of the poacher, and more encouragement should be given them by reducing licence fees which are at present excessive in comparison with the bag obtainable and by throwing open to the general public some at any rate of the Game Preserves.

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Legislation is also required to prevent the sale of game in the close season; this would considerably restrict the activities of the motor poacher who shoots solely for gain.

To sum up, the present position of wild life in Mysore is, considering all the factors involved, not unsatisfactory; but this position will certainly deteriorate seriously in the near future unless steps are taken to prevent it, in which connection the following are suggested as most important:

(1) Strict enforcement of the existing Game Laws;
(2) Education of public opinion in every possible way;
(3) Formation of a Wild Life Fund;
(4) Prohibition of all motor car shooting;
(5) Prohibition of sale of game out of season and control of traffic in hides and horns;
(6) Protection for the Great Indian Bustard;
(7) Encouragement of genuine sportsmen; and
(8) Establishment of a National Park.

Mysore has been blessed by Nature with an unusually rich fauna, and every possible step should be taken in time to safeguard it and to make its people realise the importance from every point of view of such a national asset.

PRINTED AT THE DIOCESAN PRESS, MADRAS—1935. C4446.

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John Bale Sons & Danielsson, Ltd. London

The Large Flowered Dillenia.
Dillenia indica, Linn.
(about ⅓ nat. size)

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JOURNAL
OF THE
Bombay Natural History Society.

April, 1936. Vol. XXXVIII. No. 3.

SOME BEAUTIFUL INDIAN TREES.

BY

The late E. Blatter, s.j., ph.d., f.l.s.,

and W. S. Millard, f.z.s.

Part XX.

(*With two coloured plates and one black-and-white plate*).

(*Continued from page* 231 *of volume* xxxviii).

The Large-flowered Dillenia.

Popular Names: *Chalta* (Hind., Beng.); *Mota karmal* (Mar.); *Karambali Thabyu* (Burm.).

Dillenia indica Linn. Sp. Pl. (1753), p. 535, (Syn. *D. speciosa* Thunb.). Belongs to the family *Dilleniaceae*. *Dillenia* in honour of J. J. Dillenius (1684-1747), botanist and professor at Oxford, and author of important botanical works; *indica* after its habitat—India.

Description: An erect evergreen tree, which in favourable localities grows to a height of 30 or 40 ft. Its spreading branches form a dense rounded crown of handsome bright green foliage. The bark is smooth, red and moderately thick. It peals off in small hard scales. The leaves grow at the ends of the branches. The leaf-stalk is channelled, bout 1-2 in. long, its base partially encircling the supporting branch. An average leaf is 8-12 in. long and 4 in. in breadth. It is oblong lance-shaped with a finely pointed apex and sharply toothed margins. The close-set nerves running in regular parallel lines to the marginal teeth give the leaves a beautiful deeply fluted surface. The upper part of the leaf and the nerves beneath are covered with fine hairs. The large fragrant white flowers appear singly at the ends of the branches. They may exceed 6 in. in diameter. The club-shaped stalk of the flower is

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3 in. long, round and smooth. The calyx is composed of five fleshy rounded and concave sepals, which persist and form the outer covering of the fruit. The five large petals are oblong and heavily crinkled. The numerous stamens form a yellow crown round the white spreading rays of the stigma. The fruit is large and hard. With the sepals which surround it—it measures from 3-4 in. across. Internally it is fleshy and its many flat seeds are embedded in a glutinous pulp.

Flowers: The flowers appear in June and July.

Distribution: Moist and evergreen forests of the eastern sub-Himalayan tract, Assam, Burma and the Indian peninsula. Chiefly found along the banks of tropical forest streams and rivers and other damp places, on deep rich moist soil.

Uses: Planted as an ornamental tree. The thick sepals have an agreeable acid flavour and are eaten by the natives. When added to syrup they are used as a cough mixture (Dalzell and Gibson).

Gardening: *Dillenia* is readily propagated from seed but with difficulty from cuttings (Bailey). The tree reproduces satisfactorily from coppice-shoots, as in the Holongapar coppice coupes, Assam (Troup). Growth is moderately fast.

The fruits are buoyant in water, and those which drop into the streams from the trees along their banks are carried down until stranded. Wild elephants eat the fruits, and are probably agents in the spread of the seed. Under ordinary conditions, however, the seed has no means of escaping from the fruit owing to the rigid covering of the thickened sepals, and Nature's method of overcoming the difficulty is interesting. The fruit on reaching the ground quickly turns brown, decays and, in the hot season, shrivels into dry masses. White ants eat out the interior and fill the dry shell with earth. The seeds, however, remain untouched, and at the commencement of the rains they germinate in the earth accumulated by the white ants, and the seedlings burst through the many cracks and joints of the dried shell (see Troup, vol. i, p. 2).

The Kleinhovia.

Popular Names: (None known).

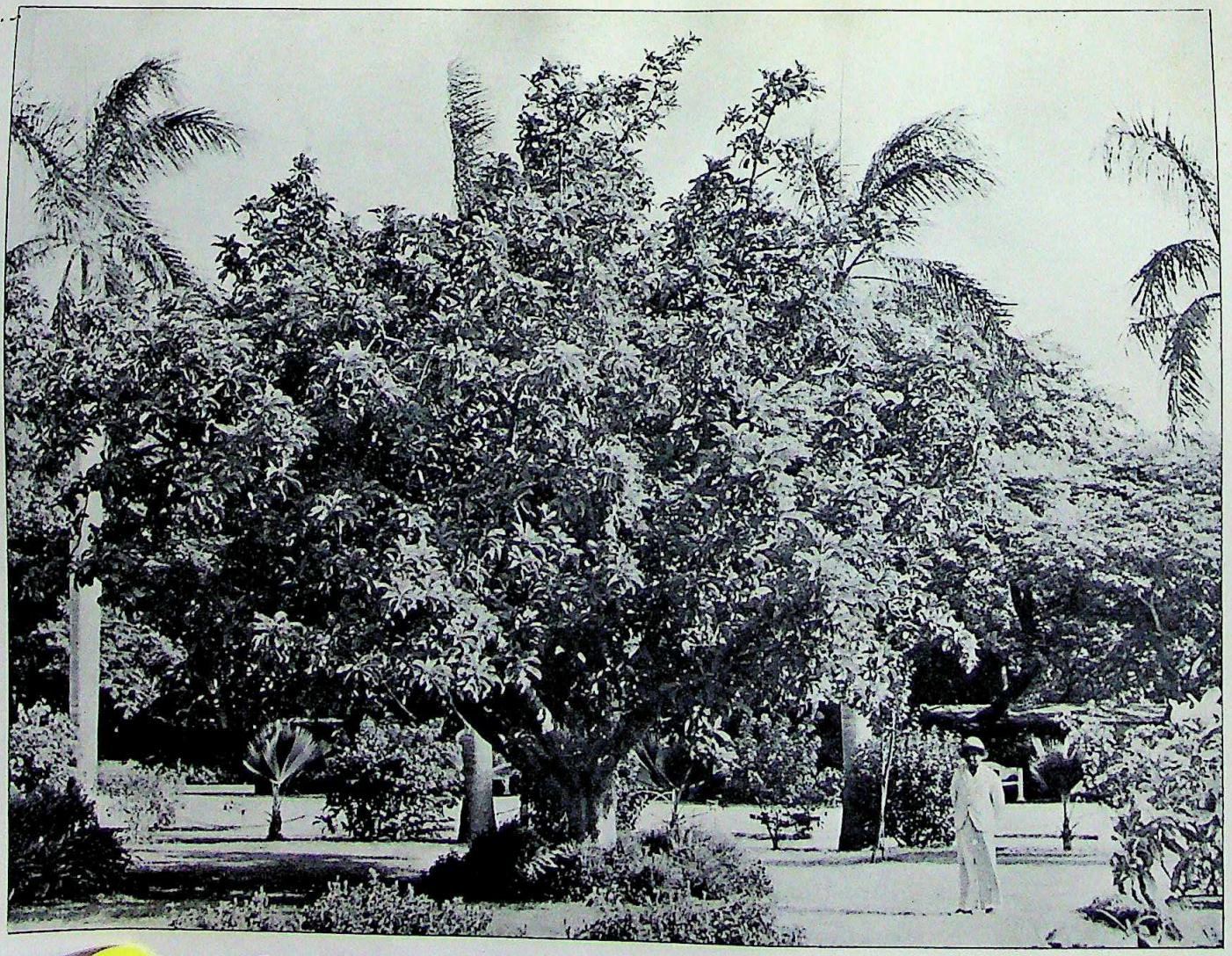
Kleinhovia Hospita Linn. Belongs to the order *Sterculiaceae*.

The species was described first in Linnaeus' *Specie Plantarum*, Ed. 2, as 'Kleinhof horti Bot. cultor in Java'. Nairne (*Flowering Plants of Western India*) says: 'A doubtful native (D) but pretty widely distributed in India (H.)'.

In regard to the derivation of the name *Kleinhovia*, by the courtesy of Mr. C. A. Backer of Heemstede, formerly botanist at Buitenzorg, we quote the following:

'Linnaeus' correspondent was Christian Kleynhoff, born (year unknown) at Sandau in Upper Silesia, who was a Government physician for three years in West India and for twenty-one years in East India and from 1741 or 1742, a civil officer of the V.O.I.C. (United East India Company). He had a garden at Batavia in which many native and Chinese medicinal plants were

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Tree of *Dillenia indica* in the People's Park, Madras. August 8th, 1935.

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Flower of *Dillenia indica*, from a tree in the People's Park, Madras. July, 1935.
(About ½ nat. size.)

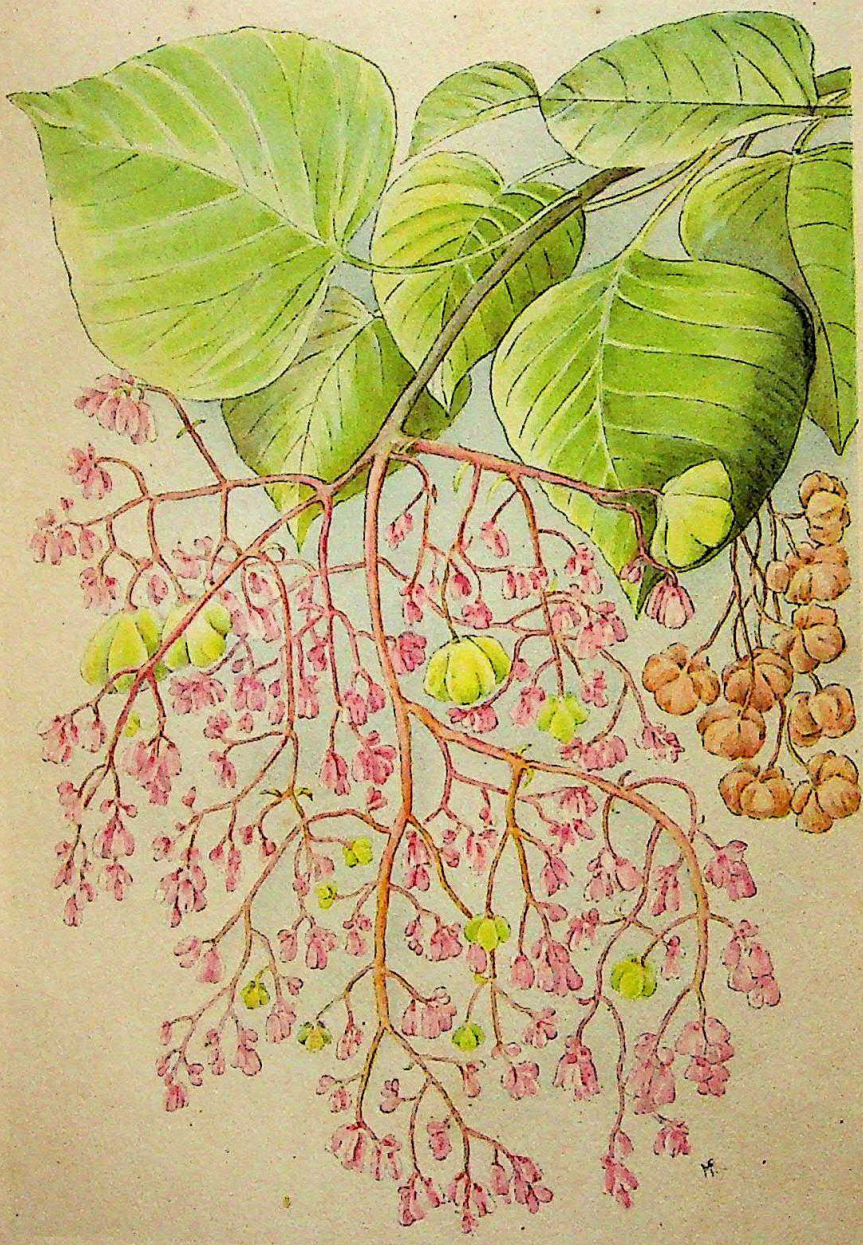
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Flower of *Dillenia indica*, from a tree in the People's Park, Madras. July, 1935.
(About ½ nat. size.)

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The Kleinhovia Tree.

Kleinhovia Hospita, Linn.

(about ½ nat. size)

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Tree of *Kleinhovia Hospita* in the Agri-Horticultural Society's Gardens, Madras.

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Flowers of *Kleinhovia Hospita*. The Agri-Horticultural Society's Gardens, Madras. September 21st, 1935.

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grown. He returned to Holland in 1763 and died at Culemborg, Holland, in 1777.'

Mr. Wm. T. Stearn, Librarian, Lindley Library, Royal Horticultural Society, London, has kindly supplied the following note on the specific name *Hospita*:

'*Hospita* is the feminine of *hospes*—a visitor, guest or stranger. Burmann's account of Kleynhoff's generosity in distributing plants and seeds suggests that the specific name (*Hospita*) refers not to a property of the plant *Kleinhovia* itself but to the hospitable Kleynhoff himself. The capital H for *Hospita* is I presume used by Linnaeus because *Hospita* is here a noun in apposition, not an adjective in agreement, in the same way as Linnaeus adopted a capital letter for generic or vernacular names used as a specific epithet, e.g. *Epidendrum Vanilla*, *Schinus Molle*, etc.'

Description: This is a moderately-sized tree with large leaves and showy panicles of delicate rose pink flowers. The leaf is oval, often with a heart-shaped base. Its nerves 3-7 in number grow out fan-wise from the base. The small flowers grow in large many-branched clusters. The fine sepals of the flower fall off early leaving only the pink unequal petals, the uppermost of which has a long claw-shaped apex. The stamens unite to form a slender column, which widens into a cup, bearing in each of its five divisions three 2-celled antlers. The ovary is 5-celled and lobed and lies in the cup formed by the stamens. The style is slender, the stigma divided into five parts. The fruit is a membraneous, inflated capsule. The seeds are marked with small tubercles.

Flowering season: July to August.

Distribution: The tree is indigenous to the delta of the Mekong River. It is common on the shores of the Malay Archipelago and grows inland in Tropical East Africa and Australia. It was introduced into Ceylon about 1820 and is now fairly established in cultivation in Western India.

Gardening: A beautiful tree particularly when in bloom and really worthy of cultivation. It is propagated by layers: seeds being rarely procurable.

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however, an adult male in the British Museum killed in 1871 at Nursipatam near Rajahmundry and the label states that it was obtained by a collector from the Madras Museum.

Falco tinnunculus objurgatus (Stuart Baker).

Cerchneis tinnunculus objurgatus Stuart Baker, *Bull. B.O.C.*, vol. xlvii (1927), p. 106—Nilgiris.

Specimens collected:—245 ♀ 17-5-29 Shevaroys 5,400 ft.

Measurements:—

Bill.	Wing.	Tail	Tarsus.
23	234	Worn.	39 mm.

There is in Southern India—and the fact has been well known from the time of Hume—a small dark resident race of Kestrel which is very largely a mountain bird. Its distribution is not yet fully worked out, but it probably breeds here and there throughout the Western Ghats as James Davidson (*apud* Barnes, *J.B.N.H.S.*, iii, 211) says that a fair number breed all along the ghats in the Nasik district where he shot a young bird unable to fly in May. This specimen from Septashring is in the British Museum and undoubtedly agrees with Nilgiri specimens.

In the Presidency it is recorded from the Wynaad where William Davison shot one (♀ juv.: wings and tail not fully grown: in the Hume Collection) near Karote at the foot of the Brahmagherries, and saw two others on those hills. It is common on the Nilgiris and their slopes, frequenting the more open and cultivated tracts and the downs and breeding on the more inaccessible crags. It occurs commonly in the Nelliampathies and Palnis, more particularly at higher elevations in the latter, and also apparently through the Travancore ranges.

On the eastern side our information is meagre, but the specimen obtained by the Survey in the Shevaroys suggests that it also has some distribution in the Eastern Ghats.

The *New Fauna* (v, p. 65) says that this race is also resident in Ceylon. I have seen no evidence to that effect. Legge clearly considered the Kestrel to be a winter visitor to the island and none of the specimens in the British Museum belong to this race. Wait did not meet with it.

Hume states that the laying season in the Nilgiris is in the last week of February, in March and in April.

The identification of the Survey Kestrels made it necessary for me to go into the general question of what races occur in India as the arrangement of the group in the *New Fauna* is most manifestly unsatisfactory. The *New Fauna* (vol. v, 61-5) admits 5 races in the Indian Empire as follows:—*tinnunculus* as a winter visitor; *interstinctus* breeding throughout the Lower Himalayas from 2,000 ft. to 8,000 ft. and also in the Assam area, wintering in Northern India; *saturatus* breeding in Burma and only a local migrant; *japonicus* (*japanensis*) breeding in Ladakh and Northern Kashmir and wintering in the Peninsula; and finally *objurgatus* resident in Southern India. The distinctions given between these forms are nebulous and have resulted in very curiously mixed identifications in different collections.

The first point to establish in this enquiry is the identity of the breeding birds of our area and here we are immediately up against the fact that breeding specimens are strangely lacking for identification. I have been through the whole of the Indian Empire series in the British Museum and, apart from specimens of the race *objurgatus*, can only find 4 breeding birds, all from the Western Himalayas. There are no specimens from Assam or Burma in the British Museum, which from their dates are likely to be breeding birds, and Dr. Ticehurst tells me that he has found no definite evidence that any Kestrel breeds in Burma at all. No specimens of probable breeding birds are included in the large collections that he has received from Burma. Luckily I can supply the deficiency in one particular. My own collection contains a good series of birds from Ladakh, Kashmir and the western Himalayas which are known to be breeding birds, in many cases shot for the identification of eggs. This series first of all establishes the fact that there is no difference between the breeding birds of Ladakh, Kashmir or the outer Himalayas down to 2,500 ft.

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The series has been most carefully compared with a good series of European birds. In size there is no difference at all.

European birds measure as follows:—

		Wing.	Tail.	Wing.	Tail.
Witherby (*Handbook*, p. 122)	15 ♂	230-252	150-173: ♀	235-265	— mm.
Ticehurst (*Ibis*, 1923, p. 262)	20 ♂	234-251	160-180: 18 ♀	244-261	162-185 mm.
H. W. Collection	12 ♂	236-256	147-165: 4 ♀	252-258	169-177 mm.

This range of variation is very wide and it amply covers the range of measurement in Himalayan breeding birds as follows:—

	Wing.	Tail.
13 ♂	232-250	154-170 mm.
8 ♀	243-264	166-183 mm.

Mr. Stuart Baker (*Bull. B.O.C.*, xlvii, p. 103) in his preliminary discussion says that the few Western Himalayan specimens killed in the breeding season are *all darkish birds* if compared with European specimens. My series, and with this verdict Dr. Ticehurst agrees after a careful comparison of them with European birds, are quite indistinguishable from European birds. They have the same wide variation in colour and markings. The only difference we can find is that some males are *paler* than any European birds we possess, but the percentage of such pale birds is not sufficient to warrant the separation of a Himalayan race. I am therefore satisfied that West Himalayan birds belong to the typical form. The identity of the breeding race (if any) in the Eastern Himalayas, Assam and Burma, remains to be established.

It has long been known that the breeding race of Southern India is separable on size and colour. It is slightly smaller as follows:—

	Wing.	Tail.
10 ♂	221-242	147-158 mm.
12 ♀	234-258	145-173 mm.

The adult male differs from the typical race in the deeper, more foxy, brick-red of the upper parts, lacking the faint wash or bloom characteristic of *tinnunculus*. The top of the head is a duller, darker grey, or even streaked rufous-brown as in the female. The grey tail is apparently always faintly barred. The underparts are well tinged with rufous and the markings on the central flanks are somewhat different in character. The female is a richer brick-red in colour, with heavy barring and the underparts also differ as in the male.

It remains to establish the identity of *Falco interstinctus* McClelland, *P.Z.S.* 1839 (March 1840), p. 154—Assam and *Tinnunculus saturatus* Blyth, *J.A.S.B.*, xxviii (1859), p. 277—Ye, Tenasserim (not Port Blair, Andamans as given in the *New Fauna*, vii, 403), in case either of these should prove to be the same bird as *objurgatus*, which is antedated by both.

Falco interstinctus of McClelland is based on descriptions in Latin and English which are merely generalised descriptions of the immature or female Kestrel and not recognisable as any particular race. Horsfield, however, goes on to explain that the real difference from the typical form is apparently that the male and female are alike in plumage and confirms this with a quotation to the same effect from Sykes. It will therefore be seen that the original describers made no claim to this form being darker, and this arose later from an examination of the supposed McClelland type in the British Museum, which has no exact data but is of the immature type of plumage, a rather dark bird with broad heavy bars. Taken alone it might be considered one of the darker phases of *tinnunculus tinnunculus*, to which all the other Assamese specimens in the British Museum belong in my opinion except a second McClelland specimen which is of a foxy red type.

Tinnunculus saturatus of Blyth from Tenasserim is, on the other hand, definitely said to be a heavily barred bird. There is no reason to suppose that any Kestrel breeds in Tenasserim and all Burmese birds that I have seen belong either to the typical race or to a heavily barred form which is

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evidently the bird that Blyth received. With these latter the type of *interstinctus* agrees.

These heavily barred birds I am unable to separate from the Japanese and N. Chinese form *Falco tinnunculus japanensis* Ticehurst (vide *Bull. B.O.C.*, vol. i, p. 10 new name for *F. t. japonicus* Temm. and Schlegel) and I have no doubt that they are winter visitors to the Eastern Himalayas, Assam, Burma, Eastern and Southern India and Ceylon from all of which localities I have seen specimens. This race has a bright foxy phase which is not found in the typical race and to it the second McClelland specimen evidently belongs. Of the three names *interstinctus* is the earliest and will therefore take precedence. *Objurgatus* is easily separated from *interstinctus* in most cases—no one can expect to name all specimens of Kestrels correctly, the species is so variable and the races so difficult to discriminate—by the smaller size, by the richer brick-red colour and the absence of bloom on the back and mantle of the adult male, and by the richly coloured underparts, *interstinctus* having the undersurface as in the typical form, from which indeed many specimens are not separable.

Falco tinnunculus tinnunculus Linnaeus.

Falco tinnunculus Linnaeus, Syst. Nat., ed. x, vol. i (1758), p. 90—Sweden, Europe.

Specimens collected: 1083 ♀ 11-12-29, 1133 [♂] 17-12-29 Cumbum Valley, Kurnool.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	21.5	231	161	36.5 mm.
1 ♀	22.5	249	159	38 mm.

The typical race of the Common Kestrel certainly occurs as a passage migrant or as a winter visitor in the Madras Presidency, and probably in some numbers, as Major Bates tells me that Kestrels are very common in the plains of the Carnatic in the winter, being about as late as April. In addition to the two Survey birds there are specimens in the British Museum as follows:—♂ 4-1-1869 Salem (Theobald), ♀ 22-1-1881 Ootacamund (William Davison) and ♂ imm. Travancore (Fry). Most of the specimens I have examined from Ceylon also belong to this race.

Falco tinnunculus interstinctus McClelland.

Falco interstinctus McClelland, P.Z.S. 1839 (March 1840), p. 154—Assam.

This race also occurs in the Presidency as a winter visitor for there are the following specimens in the British Museum:—♂ immature 15 January, ♀ 19 December 1868 Pothanore, Coimbatore (Carter), ♀ no date Travancore (Fry).

[Falco naumanni pekinensis Swinhoe.

Falco cenchris var. *pekinensis* Swinhoe, P.Z.S. 1870, p. 442—Ming tombs near Pekin.

The Lesser Kestrel is included in Inglis and Baker's *Birds of Southern India*, p. 236, with reference to Jerdon's statement that he found it breeding on the cliffs of the Nilgiris in May and June; but the authors are of course right in discrediting this record. Hume (*Scrapbook*, p. 105) gives the measurements of an adult female said to have been shot near Coonoor by Mr. Carter of Coimbatore. As however the specimen is not in the Hume Collection and it does not appear that Hume ever saw it himself, while the measurements do not rule out the possibility of the specimen being a Common Kestrel, I am not prepared to accept the record.]

[Aquila nipalensis Hodgson.

Aquila nipalensis Hodgson, Asiat. Res., vol. xviii, pt. 2 (1833), p. 13, pl. 1 (named on plate only)—Valley of Nepal.

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In the *Old Fauna* the southern limit to which the Steppe Eagle penetrates in India in winter was given as Khandesh, Seoni and Raipur, but in the *New Fauna* (v, p. 71) it is said to occur as far south as North Travancore on the authority of Mr. Stewart. As eagles are notoriously difficult to identify and it does not appear that a specimen was preserved for comparison with authentic examples I have some hesitation in accepting this bird on the Presidency list, the extension of range being so great and the country so unsuited to its requirements.]

Aquila rapax vindhiana Franklin.

Aquila vindhiana Franklin, P.Z.S. 1930-31 (October 25, 1931), p. 114—Vindhya Hills.

Jerdon states that the Tawny Eagle is unknown on the Malabar Coast and rather rare in the Carnatic and the only actual records I find for the Presidency are from the latter area. There is a specimen—Dr. Gravely is kind enough to tell me—in the Madras Museum from Poonamallee. Major R. S. P. Bates informs me that he found a nest at St. Thomas' Mount on 31st May. It then contained a single feathered chick which had become a 'brancher' by the end of June.

[**Aquila clanga** Pallas.

Aquila clanga Pallas, Zoogr. Russo-Asiat., vol. i (1811-1827), p. 351—Russia.

Jerdon states that the Greater Spotted Eagle is tolerably common in the Carnatic and the Malabar Coast but I have traced no more definite record to justify its inclusion in the Presidency list.]

Aquila pomarina hastata (Lesson).

Morphnus hastatus Lesson in Bélanger's Voy. Indes Orient. (1834), p. 217—Bengal.

The *New Fauna* (v, 76) states that the Small Indian Spotted Eagle *is* 'uncommon in Travancore and Madras' but the only authority that I can find for its inclusion in the Presidency list is a female collected at Kotagiri on 15 February now in the Hume Collection in the British Museum.

Hieraaëtus fasciatus (Vieillot).

Aquila fasciata Vieillot, Mém. Linn. Soc. Paris, vol. ii (2), 1822, p. 152—Montpellier, France.

Bonelli's Eagle was not procured by the Survey. It does, however, occur on the eastern side of the Presidency as Jerdon obtained the specimen figured in his Illustrations in the Guindy Park at Madras, and this is doubtless the authority on which Dewar included the bird in his list.

On the western side it is recorded from the Nilgiris and Travancore. In the former hills it is not uncommon according to William Davison and he had also seen it in the plains country at the base of the hills. Bonelli's Eagle is not included in Ferguson's Travancore list but Stuart Baker (*Nidification*, iv, 54) says that Stewart took many nests.

The breeding season appears to be about December in which month Miss Cockburn obtained eggs at Kotagherry (*Nests and Eggs*, vol. iii, 143).

A specimen from 'Madras' (Jerdon) in the British Museum is probably the above from Guindy Park. There appears to be no other Presidency specimen available for examination to verify the statement that South Indian birds belong to the typical race.

Hieraaëtus pennatus (Gmelin).

Falco pennatus Gmelin, Syst. Nat., vol. i, pt. i (1788), p. 272—Hungary.

The Booted Eagle was not procured by the Survey but it appears to be a fairly common winter visitor to the Presidency, keeping apparently to the plains and lower hills. On the western side we have a specimen from Coorg (Wardlaw-Ramsay) in the British Museum, while Hume states (*S.F.*, x, 335)

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that it is not uncommon in the Wynaad, whence he had received a pair many years previously. A male from Cannanore (17-10-1882 Wardlaw-Ramsay) and an unsexed bird from Calicut (1873 Hume Collection) are in the British Museum, as well as one 'Anjango' and two 'Madras' specimens. Ferguson states that the Trivandrum Museum possessed only one local specimen killed in February.

On the eastern side Dewar's inclusion of the Booted Eagle in his Madras list is doubtless based on the local specimen in the Madras Museum. A male from Pothanur, Salem district, collected by Theobald on 9 December 1868 is in the British Museum. Jerdon mentions a specimen procured by Mr. Hooper C. S. at Trichinopoly (*Madras Jour. Lit. Sci.*, 1839, p. 75).

Hume (*Scrapbook*, p. 186) described a nest with 2 eggs taken by his collector Mr. Theobald on 21 February 1869 at Hurroor, Salem district, from which the parents, both in the brown plumage, are said to have been shot. This record has been copied from book to book and is included in Mr. Stuart Baker's *Nidification* (vol. iv, p. 56). In my opinion it is quite untrustworthy and I am of opinion that the nest was that of the Common Pariah Kite. The description of the egg is unlike that of the Booted Eagle and agrees with that of the Kite; the breeding of this migratory eagle in Southern India is quite unlikely; and finally Theobald was a most unreliable collector [vide his account of the breeding of Montagu's Harrier in a tree in the same district (*Scrapbook*, p. 305) and of the Long-legged Buzzard in the Salt Range (*loc. cit.*, p. 277)]. The Booted Eagle frequently flies with Kites (cf. Bruce Amer. Nat., vi, 1872, p. 460) and I myself in my early collecting days in India procured my first specimen of the brown phase of the Booted Eagle when I was shooting kites as food for a captive Lämmergaier. No doubt Theobald shot his birds near the nest, not *from* it.

Lophotriorchis kienerii (Sparre).

Astur kienerii Sparre, Mag. Zool. Ois. (1835), pl. 35—Himalayas.

According to the *New Fauna* (v, 81) the Rufous-bellied Hawk-Eagle is found in the 'south-west coast of India from Southern Bombay Presidency to Ceylon' but I can find no record from further north than the Wynaad from where Primrose believed that he had secured a specimen (*J.B.N.H.S.*, xvi, 164). The identity of this specimen appears never to have been confirmed and its present whereabouts is not known. With this exception I cannot trace it further north than the Anamallai Hills where Kinloch found a nest with a young bird in December 1906 (*J.B.N.H.S.*, xvii, 1027). In Travancore it is a resident species but not common. Bourdillon obtained a specimen at 2,000 ft. and thought that he had seen another alive (*S.F.*, vii, 33) and Ferguson shot one at the foot of the hills in South Travancore in April 1901. A supposed specimen of the egg taken on 16 February 1906 is described by T. F. Bourdillon in the *Journal* (xviii, p. 499).

In *Nidification* (iv, 57) Mr. Stuart Baker gives us very complete information of the status of this fine eagle in Travancore on the authority of Mr. Stewart. It is said to breed at all heights from 1,000 to 4,000 ft., but principally between 1,500 and 3,000 ft. while the egg has been taken from 27 November to the end of March.

On the eastern side of the Presidency the bird is not known to occur.

There appears to be no specimen of the Rufous-bellied Hawk-Eagle from the Presidency available for examination unless a female dated 26-10-1876 in the British Museum from the 'Great Valley' is possibly Bourdillon's original specimen. I have not therefore been able to verify the identity of these south-west birds with the Himalayan race.

Ictinaëtus malayensis perniger (Hodgson).

Aquila perniger Hodgson, J.A.S.B., vol. v (1836), p. 227—Nepal.

The Black Eagle is well known on the western side of the Presidency where it must be very generally distributed through the hill jungles. Jerdon states that he saw it in Coorg and Mr. Betts has recorded that he saw one there for about a week in November 1928. Jerdon also saw it in the Wynaad and a nest taken there early in January is recorded by Daly (*J.B.N.H.S.*, xii, 589).

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All observers agree that it is not uncommon on the Nilgiris and their slopes, though avoiding the actual plateau and it is also common on the Nelliampathies (Kinloch). In the Palnis Fairbank observed it at three different places about 4,000 ft.

In Travancore Bourdillon and Ferguson considered it a fairly common resident from 500 ft. upwards. Stewart is said to have taken eggs in Travancore between 1,000 and 4,000 ft., the breeding season being apparently from November to February, though one egg was taken on 9th September (*Nidification*, iv, 61). There are 5 specimens in the British Museum from Kotagiri (Cockburn) and Mynall (Bourdillon).

Jerdon tells us that he also saw the Black Eagle on the Eastern Ghats and Mr. LaPersonne reports that he saw a fine specimen on the Shevaroy Hills.

As no specimens were procured by the Survey I have not checked the identification of South Indian birds.

Nisaetus cirrhatus cirrhatus (Gmelin).

Falco cirrhatus Gmelin, Syst. Nat., vol. i, pt. i (1788), p. 274—India.

Specimens collected:—310 ♂ 2-6-29 Chitteri Hills 2,000 ft.; 643 ♀ 3-8-29, 713 ♀ 19-8-29 Palkonda Hills 1,000 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	41	398	278	100.5 mm.
2 ♀	45-46	424-434	284-288	102-102.5 mm.

The Crested Hawk-Eagle is found on both sides of the Presidency. On the eastern side there is a record from Chatrapur, Ganjam (where a Captain Pritchard shot a specimen on 7 March 1904). As the bird had been particularly noticed about since the preceding November and the same gentleman was said to have killed one previously in 1895 it is obvious that the species was not considered common in this area (C. E. C. Fischer, *J.B.N.H.S.*, xv, 716).

Jerdon states that he obtained this eagle in the Eastern Ghats and doubtless some of the six specimens marked 'Madras' in the British Museum came from the Eastern Ghats, but the three Survey specimens supply the only other precise records from this side. Mr. LaPersonne remarks regarding them that many were observed in the forest round Ballepalle and that in the Chitteri range its call might be heard daily.

On the west both Hume (*S.F.*, x, 336) and Primrose (*J.B.N.H.S.*, xvi, 165) state that the Crested Hawk Eagle occurs in the Wynaad and the Nilgiris and a male collected by William Davison on 28-4-1876 at Seegore is in the British Museum. Kinloch says that it is very common in the Nelliampathies.

There appears to be no record of the breeding season in the Presidency.

With reference to the note on the identity of the 'Devil-bird' given *ante* (p. 233) it may be remarked that Dr. Spittel in Ceylon was convinced (for reasons given in full *J.B.N.H.S.*, xxx, 914) that this eagle is the author of the nocturnal cries. Mr. LaPersonne is of the same opinion after his visit to the Chitteri range.

Nisaetus cirrhatus ceylanensis (Gmelin).

Falco ceylanensis Gmelin, Syst. Nat., vol. i, pt. i (1788), p. 275—Ceylon.

This race of the Crested Hawk-Eagle is stated by Mr. Stuart Baker (*New Fauna*, v, 86 and *Nidification*, iv, 64) on the authority of Mr. Stewart to be very numerous in the south of Travancore. It is said to breed from the foothills upto about 2,500 ft.: and eggs are usually laid in January and February, though Stewart has taken them from early December to the end of March.

The only specimen which I have examined is an 'Anjango' bird in the British Museum which is the type of Hume's *Spizaëtus sphynx* (*S.F.*, i, 319).

Nisaetus nipalensis kelaarti Legge.

Spizaëtus kelaarti Legge, Ibis 1878, p. 202—Ceylon.

This race of Hodgson's Hawk-Eagle is confined to the western side of the Presidency. Hume received an adult specimen from the Nilgiris (*S.F.*, iv,

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446) which was given him in June 1872 by Mr. F. L. Chapman of Ootacamund (*S.F.*, x, 336) though the racial identification was never confirmed. Mr. Betts informs me that he shot one in his bungalow compound 4 miles from Nedivattam.

In Travancore, according to Ferguson it is rare and confined to the hills. Three specimens obtained by Bourdillon at Mynall (♂ 18-12-76, ♀ 9-7-78, ♀ juv. not dated) are in the British Museum. Stuart Baker states on the authority of Stewart that the bird breeds between 1,000 ft. and 4,000 ft. (*Fauna*, v, 91; given as 3,000 ft. in *Nidification*, iv, 68) and that the breeding season lasts from early December to the end of March, most eggs being laid in January.

Circaetus ferox (Gmelin). Olim *Circaetus gallicus* (Gmelin).

Accipiter ferox S. G. Gmelin, Nov. Comm. Acad. Petrop., xv (1771), p. 442, pl. x—Astrakan, S. Russia.

The only record of the Short-toed Eagle which I can trace for the Presidency is the statement by Stuart Baker (*Nidification*, iv, 69) that Stewart took two or three nests in Travancore.

For the change of name from the time-honoured *Circaetus gallicus* (Gmel.) see Grant, *Ibis* 1934, p. 644.

Haematornis cheela melanotis (Jerdon).

Buteo melanotis Jerdon, Madras Jour. Lit. Sci., vol. xiii (1844), p. 166—at the foot of the Nilgiris.

The status of the Crested Serpent Eagle on the eastern side of the Presidency appears to be quite unknown. Jerdon met it at Goomsoor. Dewar includes it in his Madras list without any comment and I have a note that it breeds at Yercaud but cannot trace the authority for either statement. On the west it is well known. In Coorg, according to Betts, it is common though not numerous, and William Davison and Primrose (*J.B.N.H.S.*, xvi, 165) both state that it is not uncommon in the Wynaad.

In the Nilgiris according to Davison it does not occur on the higher hills and is uncommon on the slopes, becoming more numerous at the foot of the hills. Kinloch calls it common in the Nelliampathies but in the Palnis Fairbank only saw a single pair.

In Travancore Ferguson says that it is fairly common in the low country and also on the hills. This statement is expanded by Stuart Baker on the authority of Stewart. He considers that there are two races in the country, of which the larger called *H. c. minor* is very common in the plains and foothills, and the smaller, considered identical with the Ceylon bird *spilogaster*, is found in some numbers between 500 ft. and the highest hills, but most commonly between 500 and 2,000 ft. The breeding season of the larger bird is given as December to March and of the smaller as January to March (*Nidification*, iv, 72-75). To anyone who knows this eagle in life this altitudinal difference of races cannot seem satisfactory. The chief characteristic of the bird is its propensity for soaring very high in the sky, so it is hard to believe that birds which must meet daily in their common playground the air can segregate into two races, one breeding from sea level up to 500 ft., the other above the 500-foot contour. The evidence on the point also can hardly be very strong as in the *New Fauna* Mr. Stuart Baker, again on the authority of Stewart, states (vol. v, p. 99) that *minor* breeds in the plains and on page 101 that it is confined to the higher and drier ranges where the forest is almost deciduous, while on the latter page *spilogaster* is said to be resident in the wetter evergreen forests at the lowest elevations and sea levels. A similar confusion over the breeding ranges of *H. c. cheela* and *H. c. minor* occurs in *Nidification*, vol. iv, pp. 71 and 73, the breeding bird of Nadia being attributed to each in turn.

The explanation is, I think, that sufficient allowance has not been made for the fact that the Crested Hawk-Eagle—like many other birds-of-prey—is a species with a good deal of individual variation, both in colour, amount of spotting and barring, the colour of the undertail coverts and size. The grease staining on the lower parts of many skins in the British Museum has also been mistaken for true colouration.

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The situation as regards India and Ceylon appears to me to be as follows. The typical race breeds along the Himalayan foothills and the neighbouring forest areas as far westwards as Kangra and Gurdaspur, visiting also the Indo-Gangetic Plain in winter. This race has the chin and throat blackish, the breast somewhat barred and the tail-bar almost pure white. It is also very large:—

	Bill.	Wing.	Tail.
3 adult ♂ Punjab foothills	42-50	472-479	296-305 mm.
2 adult ♀ Punjab foothills	47.5-48	482-484	299-304 mm.

Birds from the Peninsula southwards to Travancore and also from Ceylon all appear to me to be similar in colouration, except for individual variation. The chin and throat do not usually become black, the breast is generally uniform and the tail bands are grey, not white. They show a steady diminution of size from north to south, obscured no doubt again by individual variation, and most marked in Ceylon. On size alone I would, therefore, separate the Cinghalese bird *H. c. spilogaster*:—

	Bill.	Wing.	Tail.
4 adult ♂ Ceylon	41-44	370-389	222-240 mm.
3 adult ♀ Ceylon	42-44	384-398	240-250 mm.

I have not been able to trace the specimens collected by Stewart and have only been able to examine 4 males from Travancore. These measure:—bill, 43-46; wing, 387-434; tail, 244-279; which is clearly larger than Cinghalese specimens and agrees well with 4 males from Kanara:—bill, 44-46; wing, 399-431; tail, 250-265 mm.

I therefore attribute all birds from Travancore to the continental form and for this Jerdon's name *melanotis*, wrongly given in *New Fauna*, vii, p. 410, as a synonym of the typical race, takes precedence of *minor*.

Butastur teesa (Franklin).

Circus teesa Franklin, P.Z.S. 1830-1831 (October 25, 1831), p. 115—Between Calcutta and Benares and in the Vindhyan Hills between the latter place and Gurra Mundela.

Not found by the Survey. The White-eyed Buzzard is far scarcer in the Presidency than in the rest of India and on the eastern side I only know of a male in the British Museum collected by Blanford north-west of Rajahmundry on 29 May 1871 and a local specimen in the Madras Museum, the basis for Dewar's inclusion in his list.

On the west it is only recorded from Travancore where Ferguson says it is not uncommon in the low country but does not ascend the hills.

Haliaeëtus leucogaster (Gmelin).

Falco leucogaster Gmelin, Syst. Nat., vol. i, pt. i (1788), p. 257—no locality = New South Wales.

How far the White-bellied Sea-Eagle is distributed along the wide-flung coast-line of the Madras Presidency is not certain but it has as yet only been recorded from a few localities. There are two 'Madras' specimens in the British Museum, as well as a bird in the Hume Collection from Narasapatam, Vizianagaram. An interesting note by Mr. S. C. Law on two pairs observed by him at Vizagapatam will be found in the *Journal* (xxix, 1059). Dewar includes the species in his Madras list without comment. Jerdon (*Madras Jour. Lit. Sci.*, 1839, p. 65) says that he saw it over the Chilka Lake, at Ponay and again near Calicut.

Ichthyophaga ichthyaëtus (Horsfield).

Falco ichthyaëtus Horsfield, Trans. Linn. Soc., vol. xiii, pt. i (May 1821), p. 136—Java.

I can find no information about the Large Grey-headed Fishing-Eagle in the Presidency except the statement (*Nidification*, iv, 82) that Stewart found it breeding in Travancore and Betts' record from Coorg. The latter states

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that the only pair he had seen haunted a small tank in the jungle on the Coorg-Mysore frontier where they had an eyrie up in a tree.

Hume considered (*S.F.*, v, 129) that Indian birds were smaller than Javan. So in the absence of specimens I have kept the name binomial.

Haliastur indus indus (Boddaert).

Falco indus Boddaert, Tabl. Pl. Enlum. (1783), p. 25 for Pl. Enl., 416—Pondicherry, India.

Specimens collected:—302 ♀ 1-6-29 Chitteri range 2,000 ft.; 597 ♂ 25-7-28 Tindivanum near Pondicherry.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	34	371	194	51 mm.
1 ♀	—	391	200	49 mm.

The Brahminy Kite is a very common resident and generally distributed in the Presidency though there is no record of it north of the Godavery Delta where LaPersonne found it common on the river. It is exceedingly abundant about Madras itself, and in Salem district LaPersonne found it fairly common around villages, ascending also the Shevaroys and Chitteri Hills. In this area Foulkes (*J.B.N.H.S.*, xvi, 757) had an interesting experience in the Pikkili Hills in April, watching 600 birds collect nightly to roost.

On the western side Betts says that it is occasionally seen, though far from common, in Coorg. It is much more common in the Wynaad, according to William Davison, being found in every paddy field. All observers agree that the Brahminy Kite is less common in the Nilgiris, though a few may always be seen about the lake at Ootacamund. In none of the western ranges does it normally breed.

A note on this species catching termites with *Milvus m. govinda* at Geddesal, Coimbatore, will be found in the *Journal*, vol. xvii, 526 (C. E. C. Fischer).

In the Nelliampathies it is common in fine weather, coming up from the plains (Kinloch). Fairbank found it common on the tanks and ponds near the base of the Palnis and in these hills he observed it up to 4,000 ft. while Terry observed a pair at Kodaikanal, where they usually hawked about the lake.

In Travancore it is common all over the low country, preferring the neighbourhood of the sea and the palmyra plantations some miles inland. Here too it occasionally visits the hills in the hot weather.

Nothing appears to have been recorded about the breeding season of the Brahminy Kite in the Presidency except in Travancore where it is said to breed in January and February.

Milvus migrans govinda Sykes.

Milvus govinda Sykes, P.Z.S. 1832 (31 July 1832), p. 81—Dukhun.

Specimens collected:—264 ♀ 21-5-29 Shevaroy Hills 4,800 ft.; 325 ♀ 3-6-29 Chitteri range 2,000 ft.; 696 ♂ 15-8-29 Palkonda Hills 1,000 ft.; 1741 ♀ 29-4-1930 Jeypore Agency 3,000 ft.

Measurements:—

	Bill.	Wing.	Central tail.	Outer tail.
1 ♂ imm.	35.5	426	213	246 mm.
2 ♀ ad.	37-38.5	418-437	217-227	244-269 mm.
1 ♀ imm.	39	413	213	242.5 mm.

The Common Pariah Kite seems to be very generally distributed and numerous throughout the Presidency though there are few details available from the eastern side. The Survey specimens and two birds in the British Museum collected north of Ellore by Blanford are supplemented by Dewar's statement that it is found in great numbers at Madras. Here as at other ports it is found about the harbour. William Davison saw one accompany a ship the whole way from Madras to Calcutta (*S.F.*, ii, 150), and H. B.

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Tilden (*J.B.N.H.S.*, xxxi, 526) saw one strike a wavelet in the harbour and after flopping about in the water for half an hour sink and drown.

On the western side the kite is apparently more of a local migrant. In Coorg according to Betts it occurs round most villages but not in great numbers and it disappears at the end of the hot weather, not apparently breeding in the district. There is no information about it in the Wynaad but in the Nilgiris it keeps mostly to the neighbourhood of the stations and villages, and is less numerous on the estates though found at all elevations. It is common from December to the beginning of the rains in June, but very few are to be seen during the South-West Monsoon.

Fischer remarks (*J.B.N.H.S.*, xvii, 526) on kites collecting to a termite hatch at Geddesal, Coimbatore, and he also remarks on the way they collect in Kollegal Taluk to eat dead silk-worms thrown out by the villagers.

In the Palnis the kite is common round the base of the hills but scarce over about 3,000 ft. It is common in fine weather in the Nelliampathies, but Kinloch believes it is only a daily visitor from the plains, not roosting in the hills.

In Travancore the bird is abundant in the low country and though common also in the hills is apparently only found up there in the hot weather, also possibly only as a daily visitor.

Ferguson gives the breeding season in Travancore as February and March. William Davison says that in the Nilgiris it is in December, January and February and at Madras he took the nest at the latter end of December.

In the pages of *Stray Feathers* (i, 160; iii, 35, 229-30, 275; iv, 272; viii, 180, 466; ix, 309; x, 181) there was a good deal of discussion as to whether the *Milvus govinda* of Sykes was the larger or the smaller of the two Peninsula forms. Brooks held that it was the larger bird *lineatus* whilst Hume maintained that it was the ordinary smaller bird since known by the name. There can be no doubt that Hume was correct and the type now in the British Museum, if correctly so designated, supports his view, being an ordinary adult bird (bill, 37; wing, 438; tail, 264 mm.). The further controversy as to whether there are two or three forms in India—in addition to *Milvus migrans migrans* since shown to breed in Baluchistan—was justified. The kite, like many other species, increases slightly in size in India from south to north, and the difference will be seen if these Survey specimens are compared with the following Punjab series in my collection:—

	Bill.	Wing.	Central tail.	Outer tail.
5 ♂ adult	38-40.5	435-471	221-247	266-310 mm.
1 ♂ imm.	38.5	453	234	266 mm.
3 ♀ adult	39-40.5	463-470	246-256	281-301 mm.
1 ♀ imm.	40.5	466	237	274.5 mm.

The South Indian series is, however, so small, and the number of intermediate birds so great that the recognition of two races in the Peninsula—in addition to the large Himalayan form *lineatus*—does not at present appear of value.

Elanus caeruleus vociferus (Latham).

Falco vociferus Latham, Index. Orn., vol. i (1790), p. 46—Coromandel Coast.

Not reported by the Survey. There is very little information about the status of the Black-winged Kite in the Presidency. On the eastern side all we know about it is furnished by the specimen in the Madras Museum from Kolambakkam, Chingleput District, and by Theobald's account (*Scrapbook*, p. 305) of the breeding of Montagu's Harrier in Salem district. This nest contained three feathered young on Christmas day and the description leaves no doubt in my mind that the nest really belonged to the Black-winged Kite.

On the west the bird is better known. Primrose states (*J.B.N.H.S.*, xvi, 165) that he saw a pair hawking at Poda Padi at the foot of the South Wynaad Hills and specimens from the Wynaad (♀ 5-12-1877, Darling) and Sultan's Battery (♀ 19-2-1883, William Davison) are in the British Museum. Davison speaks of it as rare, saying that he had shot one some years previously at Neddivattum and that his shikari had got another below Kotagherry, the bird having been seen by him on perhaps half a dozen occasions in all.

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Kinloch considered it somewhat rare in the Nelliampathies, only occasionally appearing as a visitor for a day from the plains.

Ferguson had only two records for Travancore. One was shot in Trivandrum and another seen in open grass land at Sastancotta in the low country near Quilon, both occasions being in March.

Circus macrourus (S. G. Gmelin).

Accipiter macrourus S. G. Gmelin, Nov. Comm. Acad. Petropol., vol. xv (1771), p. 439, pl. viii and ix—Voronezh to River Don, Russia.

Not obtained by the Survey. The Pale Harrier is a common winter visitor to the greater part of the Presidency, though as usual there are not many records from the eastern side.

In the Jeypore Hills, Vizagapatam, Donald met with a number collecting to roost with Marsh and Pied Harriers on a bare plateau on 13 February (*J.B.N.H.S.*, xvi, 504). Dewar was doubtful whether the species could be included in his Madras list but there is a specimen from Singaperumal Coil, Chingleput, in the Madras Museum and Major Bates informs me that Harriers, presumably of this species, were common at St. Thomas' Mount. There he first noted them in 1929 on October 16th and in 1924 on October 18th, and in 1930 they were common up till April 21st. A Harrier of some sort was seen on the grass farms on June 3rd and again about a mile up the Adyar River from the grass farm on June 13th.

In Coorg Betts gives the date of arrival as 4 November (1928) (*J.B.N.H.S.*, xxxiii, 718). A specimen collected in the Wynaad on 1 January 1878 by Darling is in the British Museum. In the Nilgiris William Davison considered it a very abundant winter visitor coming in about the end of October (first noted 23 October 1929 Betts, *J.B.N.H.S.*, xxxiv, 569) and seen as late as the last week in April. Primrose, however, points out (*J.B.N.H.S.*, xvi, 165) that they are usually not common above 5,000 ft.

In Travancore the Pale Harrier is not uncommon from November to February. It is found both in the low country and in exposed grass land on the High Range at 6,000 ft. There are specimens from both the Nilgiris and Travancore in the British Museum.

Circus pygargus Linnaeus.

Circus pygargus Linn., Syst. Nat., ed. x, vol. i (1758), p. 89—England.

Montagu's Harrier is doubtless a regular winter visitor to the Presidency and Hume remarks (*Scrapbook*, p. 306) that the Nilgiris provide one of the areas of its greatest abundance in India, though William Davison curiously enough does not include it in his list.

In Travancore, according to Ferguson, it arrives about December and is found both in the hills and plains. An adult male collected by Bourdillon at Eridge on 28 December 1877 is in the British Museum.

In Salem District Hume's collector, Theobald, stated that Montagu's Harrier was common from December until May or June and this identification was supported by specimens of which an adult male, collected on 18 January 1869, is in the British Museum. His account of the breeding in that district (*Scrapbook*, p. 305) was, however, evidently due to confusion with *Elanus caeruleus*.

The bird is included without comment by Dewar in his Madras list. It was not obtained by the Survey.

Circus melanoleucos (Pennant).

Falco melanoleucos Pennant, Ind. Zool. (1769), p. 2, pl. ii—Ceylon.

The Pied Harrier was not obtained or recorded by the Survey, but it is evidently a regular winter visitor and passage migrant (on its way to Ceylon) in the Presidency. Donald met with a few roosting with numbers of Marsh and Pale Harriers in the Jeypore Hills on 13 February (*J.B.N.H.S.*, xvi, 504). Dewar includes the species in his Madras list and a specimen from Chingleput is in the Madras Museum. Of three adult males in the

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British Museum marked 'Madras' one at least apparently came from the neighbourhood of the capital.

On the west the Pied Harrier occurs but sparingly in the Wynaad and on the Nilgiris and their slopes according to William Davison, and Primrose (*J.B.N.H.S.*, xvi, 165) mentions seeing a few on the Terramia Tea Estate.

In Travancore, according to Ferguson, it is less common than the other species, frequenting the low country as well as the hills. A female collected by Bourdillon on 18 April 1877 in the Colathoorpolay Patnas 3,800 ft. is in the British Museum. In Travancore it may be seen as late as the beginning of April.

Circus aeruginosus aeruginosus (Linnaeus).

Falco aeruginosus Linnaeus, Syst. Nat., ed. x, vol. i (1758), p. 91—Sweden.

Not procured by the Survey. On the eastern side the Marsh Harrier is only recorded from the Jeypore Hills, Vizagapatam, where Donald found it the most numerous species in the congregation of Harriers at a roost on a bare plateau on 13 February (*J.B.N.H.S.*, xvi, 504).

On the west it is a fairly common winter visitor. Betts' date of first arrival in 1932 in Coorg, namely September 26 (*J.B.N.H.S.*, xxxvii, 225) and William Davison's specimen in the British Museum, collected in the Brahmagherries on 16 April 1881, suggest the normal duration of its stay in the Presidency.

William Davison says that the Marsh Harrier is not uncommon on the Nilgiris and their slopes. Primrose records a bird at a small swamp in the Terramia Tea garden (*J.B.N.H.S.*, xvi, 165), and a male collected at Kotagiri (Cockburn) on 28 January 1875 is in the British Museum.

In Travancore, according to Ferguson, this is the commonest Harrier, found about paddy fields in the low country from October to April. It does not, however, ascend the hills.

Buteo buteo burmanicus Hume.

Buteo burmanicus Hume, Stray Feathers, vol. iii (1875), p. 30—Thayetmyo, Upper Pegu.

No specimen of a Buzzard was secured by the Survey, and the genus does not yet appear to have been recorded from the eastern side of the Presidency.

On the western side there are several records and one species appears to be a not uncommon winter visitor to the hill ranges. No two authors agree as to the identification or the nomenclature of the forms of Buzzard which are resident in or winter visitors to India, and I despair of ever being able to settle these oft-debated questions. There seems, however, to be little doubt that the Buzzards which visit South-West India in winter all belong to the smaller form which has been treated variously as *Buteo vulgaris, B. desertorum, B. plumipes, B. japonicus* or, as in the *New Fauna, Buteo buteo burmanicus*.

A male was shot by William Davison on 16 April 1881 in the Brahmagherries. This was described by Hume as *B. desertorum* in *Stray Feathers* (x, 159 and 338) after submission to Gurney.

Jerdon had previously shot a specimen in the Nilgiris and seen one or two others (*B. of I.*, i, p. 88). These he called *Buteo vulgaris* or *Buteo rufiventer*. William Davison also saw Buzzards on several occasions in the Nilgiris and on the strength of a specimen in the dark fuliginous plumage seen at Ootacamund attributed them to the name *Buteo plumipes*. This was also the name given by Hume to a specimen received by him from Bourdillon in Travancore (*S.F.*, iv, p. 358). Bourdillon called it a not uncommon winter visitor in December, January and February preferring high open country at 2,000 ft. and higher. Ferguson later added—under the name *desertorum*—that he had often seen them over the grassland at Ponmudi, without however obtaining a specimen.

It is stated in the *Old Fauna* (iii, 389) that the genus *Buteo* is remarkable amongst its near relatives in having no distinct immature plumage and this statement is very generally accepted as correct, and is agreed to in the *New Fauna* (v, 136). It seems curious therefore that on the next page Mr. Stuart

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Baker has given separate keys to the adult and immature plumages, a procedure adopted in no other genus of the Falconidae.

Astur badius dussumieri Temminck and Lang.

Falco dussumieri Temminck and Lang., Planch. Color. d'Ois (November 1824), livr. 52, pl. 308—Bengal, India.

Specimens collected:—452A ♀ 20-6-29 Tirthamalai 1,000 ft.; 794 ♂ 4-9-29, 828 ♀ 18-9-29 Kodur 500 ft.; 861 [♂] 1-10-29, 915 [♀] 13-10-29 Seschachalam Hills 2,000 ft.

Measurements[1]:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	19.5-20	176-178	137.5-141	47.5-48 mm.
3 ♀	22.5-23.5	204-208	156-163	48-54.5 mm.

Unless Jerdon's statement that the Shikra is very common through the whole of India is held to cover the eastern side of the Presidency we have no record of this species in that area beyond Gooty (*Nidification*, iv, 104), the Survey specimens and Dewar's inclusion of the name without comment in his Madras list. On the west there is more information. In Coorg it is widely spread but not common according to Betts. In the Wynaad it is common according to Primrose (*J.B.N.H.S.*, xvi, 165) and William Davison and thence it extends commonly up the slopes of the Nilgiris as far as the plateau, where however it is only sparsely distributed.

Kinloch says that the Shikra is common in the Nelliampathies. In Travancore Ferguson says it is a very common resident in the low country and at the foot of the hills. It ascends the hills occasionally but only where there is open land.

Bourdillon gives the breeding season in the Travancore plains from March to June. Stuart Baker (*New Fauna*, v, 148) says that Bourdillon and Stewart took eggs in February, March and May and in *Nidification* (iv, 102) on their authority he gives the breeding season as from the middle of January to the middle of April.

In the Nelliampathies Kinloch took eggs on 27th March and Howard Campbell took his eggs at Gooty on 22 February (*loc. cit.*).

The races of the Shikra are very difficult to define. It is clear that—speaking in general terms—a very small and dark race in Ceylon grades gradually into a large pale race in Turkestan but the degree and the gradation of these differences is so slight and their average is so obscured by individual variation that it is very difficult to know where to draw a line of demarcation between the different races.

As in any study of this species the sexes and the ages must be considered separately, it is necessary to point out that the *New Fauna* (v, 148) is wrong in saying that the adult female is like the adult male. The adult male Shikra has the entire upper plumage an ashy blue-grey with the central tail feathers unbarred, indeed unmarked save for in some cases an obsolescent spotting along the shafts, indicating the position of the vanished bars. The adult female, on the other hand, has the upper plumage dark smoky brown, washed with grey while the central tail feathers have rather more trace of barring extending also to their webs. This distinction is maintained in all adults that I have seen and the difference in size between the sexes is also very constant.

If Ceylon birds (*badius*) are compared with birds from Bengal (*dussumieri*) it will be found that in the adult male and female there is no constant difference in colour. Odd males from Ceylon and Southern India are darker above and similarly odd males from North-West India are paler and brighter. Some females from Ceylon and Southern India have the barring on the lower plumage darker and browner, but these differences are purely individual and probably do not affect 50 per cent of a series, so alone cannot be regarded as subspecific. The immature male and female in Ceylon are, however, very distinct, a very rich dark brown with bright rufous edging on the upper

[1] Adult and immature birds of the same sex do not appear to differ in size.

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parts, contrasting definitely with the grey washed tail. The shaft streakings on the lower plumage are a very rich dark chocolate brown in colour. Immature birds from the continent are alike, whether in the North-West, Bengal, or further South. The upper parts are paler with pale fulvous edging and a grey wash so that there is little contrast with the upper surface of the tail. The streaks on the lower plumage are much paler, a more rufous brown. This character of the juvenile plumage in Ceylon justifies separation of the island race. It also is rather smaller:—

	Wing.	Tail.
6 ♂ adult Ceylon	177.5-182	129.5-132 mm.
6 ♀ adult Ceylon	195-202	147-158 mm.

The large race *cenchroides* I have difficulty in defining for lack of material from Russian territories. Both the adult male and female are much paler above and the barring of the lower parts is also very pale. The immature bird is similar to that of *dussumieri* but is perhaps a little paler above, though single birds could not be separated with certainty. I measure specimens from Bokhara, Kandahar and Quetta as follows:—

	Wing.	Tail.
3 ad. ♂	196-198	148-154 mm.
4 ad. ♀	214-238	174-180 mm.

Hartert gives the measurements as follows:—

	Wing.	Tail.
9 ♂	185-197	150-160 mm.
6 ♀	210-222	180-192 mm.

Between these two the intergrading is so complete and so gradual that no definite racial boundaries can be fixed and as a matter of practical convenience it is best to group all birds from India proper—including the Himalayas—as *dussumieri* recognising that the proportion of dark birds will be higher in extreme Southern India and the proportion of pale birds higher in N.-W. India as they approach the boundaries of the two extreme races. It is a matter of opinion whether Travancore birds should go with *badius* or *dussumieri*. Some adults are very dark. The only immature bird I have seen, on the other hand, agrees with *dussumieri*. Measurements overlap, but on the whole I am inclined to keep Travancore birds as *badius*.

Astur trivirgatus trivirgatus (Temm. and Lang.).

Falco trivirgatus Temm. and Lang., Planch. Color. d'Ois. (Octobre 1824), livr. 51, pl. 303—Sumatra.

The Crested Goshawk is known to occur along the western side of India from N. Kanara (not Khandesh as given in the *New Fauna*, v, 154 and *Nidification*, iv, 107, though on p. 108 it is given correctly) down to Travancore and again in Ceylon. It is of course resident.

In the Presidency Primrose says that he saw a few—though he did not consider it common—in the Wynaad (*J.B.N.H.S.*, xvi, 165). Jerdon did not consider it very rare in the Nilgiris but this statement is rather objected to by William Davison who states that whereas in the Nilgiris one may obtain two or three specimens in three or four months' hard collecting, he had seen five in a single morning in the Wynaad, between Nellacotta and Davala. It certainly keeps to the wilder parts of the Nilgiris and being a very silent bird may easily be overlooked. Kinloch calls it common in the Nelliampathies and his identification is confirmed by a specimen sent me, collected in December 1923.

In Travancore it is said to be by no means common, keeping mostly to the forest-clad hills and breeding at about 1,500-2,000 ft. (Bourdillon). Stewart, however, says that it breeds from the foothills up to some 3,000-3,500 ft.

Eggs have been taken in Travancore from 2nd March to 25 May (Stewart) but the latter date is considered unusually late.

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There are only two specimens of the Crested Goshawk from Sumatra in the British Museum but they support the usually accepted statement that birds from S.-W. India agree with the typical race. It is perhaps unfortunate, however, that in *Nidification*, vol. iv, p. 107, Mr. Stuart Baker has selected this species as the most complete example of the affinity between birds from S. India and Ceylon and those of the Malay Peninsula, for it is quite impossible to keep S. Indian and Cinghalese birds under the same subspecific name.

Cinghalese birds differ from those of S.-W. India in the much deeper, more chocolate brown of the markings on the breast, flanks and upper abdomen in the adult. These markings are smaller in extent and pear-shaped in character so that the breast gives an impression of white, spotted with dark brown. In the continental birds, on the other hand the impression is more of a brown breast, with the feathers edged with white. The island form is also smaller.

	Bill.	Wing.	Tail.
2 adult ♂ Ceylon	24-25	183-184	150-152 mm.
4 adult ♀ Ceylon	27-27.5	199-206	157-168 mm.
6 adult ♂ S.-W. India	26-28	196-208	159-168 mm.
6 adult ♀ S.-W. India.	28.5-30.5	214-237	169-180 mm.

This insular form is clearly worth recognition and as no existing name refers to it I propose to call it

ASTUR TRIVIRGATUS LAYARDI subsp. nov.

Type:—♀ ad. Pillymally, Peak Forest, 15 August 1876 (Legge). British Museum Register No. 1878—10-4-23.

Astur trivirgatus indicus Hodgson.

Astur indicus Hodgson, Bengal Sporting Magazine, vol. viii (October 1836), p. 177—Nepal.

Specimen collected:—1740 [♂] 28-4-1930 Anantagiri 3,000 ft.

Measurements:—

Bill.	Wing.	Tail.
28	220	168 mm.

This fine adult male of the Crested Goshawk must from its measurements clearly be attributed to the Himalayan race, though as one would expect, it is slightly small for it and therefore intermediate in character. This provides the only record for the outlying corner of the Presidency though Jerdon says it is found in the Eastern Ghats and it is known to occur in Nagpur, Balaghat, Sambalpur, Singbhum and Manbhum. Birds from this latter area have already been attributed by Hume (*S.F.*, v, p. 8) to the Himalayan race.

Accipiter nisus nisosimilis (Tickell).

Falco nisosimilis Tickell, J.A.S.B., vol. ii (December 1833), p. 571—Marcha in Borabhum.

In spite of Jerdon's statement that the Sparrow Hawk is abundant on the Eastern Ghats, many being caught every year, it was not procured by the Survey and I have seen no specimens from this side of the Presidency. Dewar includes the bird without comment in his list, probably on the strength of the Red Hills specimen said to be in the Madras Museum.

On the eastern side the Sparrow Hawk seems to be a fairly regular winter visitor, though it is at present only recorded from the Nilgiris and Travancore Hills. In the former William Davison says that it occurs sparingly and he mentions an adult female collected by himself at Ootacamund on 7 February 1881, which is still in the British Museum. Immature females collected at Kotagherry on 25-11-74 and 11-12-74 by Miss Cockburn are also in the British

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Museum. My own collection contains adult males collected at Ootacamund on 19-1-02 by Col. H. R. Baker and 13-2-1935 by Major E. G. Phythian-Adams.

An immature female collected by Bourdillon at Mynall in the hills in winter (*S.F.*, vii, 33 and *J.B.N.H.S.*, xv, 672) and an immature male collected by Fry in Travancore are also in the British Museum.

The above specimens all belong, in my opinion, to the large pale form to which Tickell's name is applied. Tickell's type is not in existence, so far as is known, and his description of an immature male, though detailed and good of its kind, is not sufficient to allow of racial discrimination. The name has however been applied to the Asiatic breeding form on grounds given by Hartert (*Vog. Pal. Fauna,* ii, p. 1155) and this attribution is satisfactory and may well stand.

I may here note that it is evident from the fine series in the British Museum that this form is the breeding bird of the Gilgit area, so the statement in *Nidification*, vol. iv, p. 110, that *melanoschistos* is the only race breeding in the limits of the Indian Empire is incorrect.

Accipiter virgatus besra Jerdon.

Accipiter besra Jerdon, Madras Jour. Lit. Sci., vol. x (1839), p. 84—Soonda Jungles.

The Besra was not procured by the Survey and there is very little recorded about its distribution in the Presidency. On the eastern side all I can find out about it is the existence of a local specimen in the Madras Museum and Jerdon's statement that it is found here and there in the Eastern Ghats. His Indian informants also told him that it was found occasionally in the tract of jungly country in South Arcot and Chingleput, bordering on Tanjore and Trichinopoly.

In the Nilgiris William Davison considered it rare. He obtained a couple of specimens (one of which is in the British Museum:—♂ adult 18-11-1881) and saw others on the Coonoor Ghat; an immature female collected at Kotagherry by Miss Cockburn on 16 June 1874 is also in the British Museum.

Kinloch says that it is very common in the Nelliampathies and Stuart Baker, on the authority of Stewart, says that it is common in Travancore. Here the breeding season is said to last from January to May, most eggs being laid in March and April (*Nidification,* iv, p. 112). The bird is doubtless a resident in our area.

The *New Fauna* admits only two races of Besra in India namely *A. v. besra* in Southern India and Ceylon and *A. v. affinis* across the whole of Northern India and the Himalayas.

There are, however, in my opinion three races, as Himalayan birds fall into the usual eastern and western races. Of these the eastern birds agree with *Accipiter affinis* Hodgson, *Bengal Sporting Mag.*, new series, vol. viii (1836), p. 179—Nepal. Western birds differ from them as follows:—

(1) Adult ♂. The upper parts are definitely paler with more of a dove-grey tint as opposed to sooty grey. The underparts are also slightly paler and I have seen no specimens of the type which has the underparts very like those of the adult female, a type that is common in the eastern form.

(2) Immature ♂. The upper parts are markedly paler, both as regards the brown colour of the feathers, the rufous edges to them and the pale area of the hindneck, which last is white as opposed to rich rufous. The lower parts are much paler, lacking the rich rufous wash on the throat and breast found on eastern birds.

Females, adult and immature, cannot individually be separated, but in a series western birds are slightly paler.

The birds which appear in winter in the United Provinces belong to this western form. As there does not appear to be any existing name applicable I propose to call it

ACCIPITER VIRGATUS KASHMIRIENSIS Subsp. nov.

Type:—♂ ad. 14 September 1868 Murree (Coll. C. H. T. Marshall), British Museum Collection Register No. 1885.8.19.641.

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Measurements:—

		Bill.	Wing.	Tail.	Tarsus.
A. v. kashmiriensis	5 ad. ♂	18	165-167	127.5-130	49.5-53
	5 ad. ♀	21.5-23	196-207	153-160	55-58.5
	6 ad. ♂	18-20	165-173.5	123-135.5	48.5-53
A. v. affinis	5 ad. ♀	22-24	199-210	151-167	54.5-61

Accipiter virgatus besra of S. India and Ceylon is a much smaller bird as is shown by the following measurements:—

	Bill.	Wing.	Tail.	Tarsus.
4 ad. ♂	17-18	148-155	112-119.5	45.5-48 mm.
4 imm. ♀	21-22.5	178-187	137-148	52-55 mm.

It is, therefore, of the same size as the typical form (Java) but the latter is far more richly coloured.

Pernis ptilorhynchus ruficollis Lesson.

Pernis ruficollis Lesson, Traité d'Orn. (February 1830), p. 77—(patrie inconnue) Bengal.

Not procured by the Survey. The only record of the Crested Honey Buzzard on the eastern side of the Presidency which I can find is furnished by two specimens in the Madras Museum from Madras and Kodambakkam, as Dr. Gravely kindly informs me.

On the west William Davison says that the Honey Buzzard occurs throughout the Wynaad and a female collected by him at Manantoddy on 5 April 1881 is in the British Museum. It also occurs on the lower slopes of the Nilgiris where Primrose says (*J.B.N.H.S.*, xvi, p. 166) that he collected two specimens and saw a few others. A specimen from Kotagiri is in the British Museum.

In Travancore Ferguson secured a specimen at Pirmaid near the Periyar dam in January 1901.

Nothing accurate is known about the status of the Crested Honey Buzzard in the Presidency and there is little warrant for the statement in *Nidification* (iv, 116) that the bird is resident in Ceylon. Legge was clearly of opinion that it was an immigrant and did not breed in the island.

Baza leuphotes leuphotes (Dumont).

Falco leuphotes Dumont, Dict. Sci. Nat., xvi (1820), p. 217—Pondicherry.

Very little is known about the Black-crested Baza in the Presidency and it appears to be a very rare bird. The Survey did not meet with it. On the eastern side Jerdon informs us that he shot a specimen in a grove at Davroypilly in Nellore district. There is a specimen in the Madras Museum labelled Madras. The type specimen came from Pondicherry and there is a male in the Hume collection from Trichinopoly dated 1871. There is unfortunately nothing to show the month of any of the specimens but they were usually considered as supporting the hypothesis expressed by Legge that the Black-crested Baza was migratory, the birds which visited Ceylon in the cold weather probably having bred in the Eastern Himalayas.

On the western side this Baza is only recorded from Travancore and Stewart appears to have been the only observer to meet with it in that State. A specimen collected by him on 19 February 1914 in the Aneichardi Estate is in the British Museum. According to the *New Fauna* (vol. v, p. 172 and *Nidification*, iv, 121) the breeding season in Travancore is in February, March and April and Stewart took a nest of eggs on 4 July. If this is correct the bird can hardly be a migrant but Stewart obtained most of his eggs from native collectors and there may have been some mistake in the matter.

The statement (*loc. cit.*) that the young bird is unknown is incorrect. It was described by Bingham (*S.F.*, ix, 145) and it remains to be seen whether the differences attributed to the Burmese race *B. l. burmana* Sclater are not merely those of immaturity.

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Baza jerdoni ceylonensis Legge.

Baza ceylonensis Legge, Stray Feathers, vol. iv (1876), p. 247—Kandy, Ceylon.

For many years Legge's Baza could only be included in the fauna of the Presidency on the strength of a single specimen, the immature male collected in the Wynaad on 17 October 1877 by Darling and fully described by Hume in *Stray Feathers*, vii, p. 151, and reported on by Gurney (*S.F.*, viii, p. 445). Since then it has been discovered in Travancore by Stewart who says that it is rare and difficult to locate (*New Fauna*, v, 176 and *Nidification*, iv, p. 123). The breeding season in Travancore is given as from early February to the end of April, most eggs being laid in March. There appears to be no doubt that it is resident.

(*To be continued*).

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TO MALAYA FOR A RHINOCEROS.

BY

R. C. Morris, F.Z.S.

(*With 2 plates*).

Sanction having been obtained by Mr. Arthur S. Vernay from the Government of Perak, F.M.S., through Mr. Hubback, the Game Warden of Malaya, to collect a bull *Rhinoceros sondaicus* for the American Museum of Natural History, I was asked early in 1935 to undertake the expedition with the assistance of Mr. H. C. Raven of the American Museum and Professor of Comparative Anatomy at the University of Columbia. Raven preceded me to Malaya by a fortnight with the idea of making all necessary arrangements on the spot, but he found the Game Warden away on tour and was unable to effect as much as he would have liked to. However, I do not think that this at all affected the final results.

Sailing from Madras on the s.s. *Rajula* on the 21st May I discovered that I could have joined the boat five days later at Negapatam! The Straits steamer from Madras meanders down the east coast picking up and discharging cargo at the ports of Pondicherry, Cuddalore, Porto Nuovo, Karikal and Negapatam. However this enabled me to land at and see Pondicherry and Karikal, both French ports, and unromantic places they are. Pondicherry especially gives the landing visitor the impression of being 'unfinished' with the Place de Dupleix surrounded by tall unconnected pillars (apparently taken from some ancient temple) and the work on the statue of Dupleix never completed. Four iron stanchions, supports for a canopy over the statue, stand out in ugly contrast and spoil the beauty of the work. Here one sees those curious vehicles, the *push-push* carts, the only specimens of its kind in the world; built on the model of a Victoria horse-drawn carriage, of the size of a rickshaw but with four wheels and pushed from behind like a bath chair, the rackety-packety *push-push* cart is a comic spectacle. The coolies and boatmen that throng round the visitor on his arrival on the jetty insisting that his presence is required by the Commissioner of Police, the Collector of Customs or, if the names of these two officials make no impression, the Postmaster (!!), the idea being to extort bakshish as guides, are an intolerable nuisance. Karikal is said to flourish on smuggling. I landed at Negapatam to see a friend and found it uncomfortably hot and mighty unclean. Negapatam had to my mind the appearance of a dying port which had once seen far better days.

Sailing from Negapatam on the 26th we arrived at Penang at dawn on the 30th. The crossing was uneventful, the southern islands of the Nicobars were passed on the 28th and the northern end of Sumatra the following day. I was fortunate in having the Director of Irrigation and Drainage in Malaya and the

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Director of Immigration with me on board, both very pleasant companions, and the former was especially helpful in giving me a letter of introduction to his superintendent in charge of Irrigation at Teloh Anson in Perak, F.M.S. On my arrival at Penang I was met by Mr. Coulson, the Government Treasurer, and received from him the greatest help. It is perhaps not generally known that both Penang and Singapore are islands and form, together with Malacca, the three Straits Settlements of Malaya. Malacca is itself a part of the Malay Peninsula, which also comprises the nine Native States of Perak, Pahang, Selangor, Negri Sembilan, Johore, Kedah, Perlis, Kelantan and Trengganu, the first four of which are federated and the remaining five unfederated. Penang is quite rightly called the most beautiful town of the East: the whole setting is truly gorgeous and the range of hills rising to 2,000 ft. on the eastern side, to the top of which runs a funicular railway from the town of Penang, forms a superb background to a beautiful scene. Very attractive are the Chinese girls in their gaily coloured 'pyjamas'-like clothes (surely these must have given rise to the modern Western beach-pyjamas). Late in the afternoon I boarded the Straits steamer, the s.s. *Krian*, arriving at Teloh Anson, on the mighty Perak river, at 7 a.m. on the following morning. Here I was met by the Superintendent of Customs who very kindly saw my things through and found R awaiting my arrival at the Rest House. The day was spent in fixing up the hire of a launch from the Superintendent of Irrigation, taking out Arms Licenses, seeing the District Officer, Mr. de Moubray, and in making final purchases. Mr. and Mrs. de Moubray were most kind and helpful to us. R had paid a visit to Mr. Hubback's headquarters at Kuala Lipis, Pahang, and had brought back with him four Pahang Malays as camp coolies. I was fortunate in that R could speak Malay, having picked it up some years ago while collecting in the Dutch East Indies, and it speaks well for R's memory that he had forgotten little. Malay is undoubtedly one of the easiest languages in the world to learn, it is indeed absurdly easy to pick up. It struck me as amusing that a Malay cooly could spell a Malay word in English without knowing a word of English! Although Malaya has a script of its own their language is now mostly learnt by the Malays themselves in Roman characters and the use of the Malay script is fast dying out. I found the Malays, nearly all are Mohamedans, a pleasant and cheery crowd, though notoriously lazy. Living in a wonderfully fertile and rich country the Malay has never had to work hard for his living.

June 1st saw us leave Teloh Anson and work up the Perak river, finally turning off up the river Kinta, a large tributary of the Perak, arriving at our first camp, Changkat Budiman, late in the afternoon. Here we camped in a hut in a patch of rubber owned by some Indians. Mosquitoes were bad but luckily R had included in our outfit mosquito nets for our party. Some of the eggs we had purchased in Teloh Anson were not too good and Mahmet, our excellent servant, informed us that he had found

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'little fowls' inside several of them! Leaving camp early next morning with Ngah, the Game Ranger, kindly lent to us by Mr. Hubback, and four Sakais (aborigines of Malaya) I trekked northwards marching by compass, across the Kroh Reserve and had my first experience of the Malayan jungles. The going was extremely bad at times, swamp after swamp had to be crossed either knee, waist or, in one case, shoulder deep. Old tracks of elephants and fresh tracks of pig and tapir were seen but no sign of any rhino. Ngah, a nice old rogue, knew only a few words of English and described one track to me as that of a 'ham'. It took me quite a minute to realise that he meant pig. Very easy it must be to get lost in the dense and vast evergreen jungles of Malaya and a compass is most essential. Langurs of two types were seen, *Pithecus cristatus* and *P. obscurus*. The white-handed gibbon (*Hylobates lar*) and seermangs (*Symphalangus syndactylus*) were either seen or heard, as also the common tailed-macaque (*Macacus mandibularis*). The seermang is outwardly very similar to a gibbon and was formerly, in fact, classed among the *Hylobates*. Several hours of tiring struggle through swampy areas brought us to the Sakai villages at Pinggan and further on to a Chinese Rubber Plantation and shop on the Kinta river. R turned up an hour later in the motor launch. Returning with him to the Sakai villages we discussed with them the prospects of finding a *Rhinoceros sondaicus* and a reward was offered. The Sakais were anything but optimistic. No tracks of *sondaicus* had been seen, we were informed, for a long time. On our way back to the river we were drenched to the skin in a torrential thunderstorm. Heavy rain fell almost daily although June is supposed to be one of the dry months. That night we occupied a Malay's new unfurnished house, the Atap or Nipa palm roof of which was effectively rainproof.

Leaving early next morning by boat we landed and searched one of the few areas bordering the Kinta river which was not under flood water. There were no signs of any rhino tracks, of tapir a few. Proceeding in our launch further down we camped that night at Kampong Laba Kubong. From here I marched through a part of the forest bordering the Kinta with the idea of meeting R further up river. Water got into my compass and it was not functioning properly with the result that I found myself travelling in the wrong direction. Leading our way back we struggled through swamps and dwarf screw-pine, to traverse which we sometimes had to fell and walk along saplings, and eventually found ourselves on the bank of the Kinta again just as light was failing. On the opposite bank luckily was a fisherman's hut, and the owner obligingly took me upstream in his small sampan until I met R. On our way downstream again we picked up my men and camped for the night at Laba Kubong. In the morning, after collecting two or three squirrels in a rubber plantation surrounding the village, we proceeded downriver and turning up the river Kroh camped at some fishermen's huts about 2 miles up. I noticed every time I raised my shot gun to my shoulder a pleasant smell, the source of which puzzled me con-

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siderably until I found my gun had been cleaned with our skinner's 'Brilliantine'! Leaving R here I paddled up the Lampam river, a tributary of the river Kroh, in a sampan with four Sakais. Landing about 3 miles up we followed a path and then searched for rhino tracks all over that area. Fresh tracks of tapir were seen and old tracks of elephant, but none of rhino. The ground was mostly dry ,though three or four deep swamps were encountered. The leeches were bad here, although under similar conditions in other parts of the jungle we found none. On June 5th we again worked up the Lampam river with six Sakais and four Malays as porters and camped that night in one of the Elephant Control Patrol huts on a forest reserve boundary. Here we found the jungle had been quartered by lines cut through the forest prior to being felled for paddy cultivation. The Sakais made a fire with a modern petrol cigar lighter! I was also amused at seeing a message written in pencil on a tree blaze from one Game Ranger to another to the effect that food had been left for him in one of the Patrol Huts: *Barang-makantingal*, literally ('things to eat remain'). Leaving camp early we returned to the Lampam river and boated down in sampans to the launch at the fishermen's huts. Here the Sakais were paid off as we had satisfied ourselves that rhino were not to be found in the Kroh Reserve. Two or three more squirrels were collected. Travelling down the Kroh and Perak rivers we reached Teloh Anson by noon. In the afternoon Mr. Theodore Hubback with Mr. Plane, the Elephant Control Officer and Deputy Game Warden, turned up and our plans and future operations were discussed. Mr. Hubback agreed that it would be best to transfer our activities to the large area north of the Bernam river bordering the State of Selangor. On the following day we transported ourselves, our men and our kit in a hired lorry to Lima Blas Estate, a large oil palm concern, French-owned. Mr. Hubback had on the day before telephoned to the Danish Manager, Mr. Iversen, and we were most hospitably received and entertained. I cannot adequately express our appreciation of the hospitality and help we received from Mr. Iversen and his French assistants, Mr. Talau and Mr. Hine, especially the latter. I was glad at the opportunity of meeting again a first cousin of my wife who had married Talau. Hine turned up for dinner at Iversen's bungalow and I was amused to note that the four of us were of different nationalities; Iversen Danish, Hine French and R American. After an early breakfast we left next morning in one of the estate lorries guided by Hine on his motorbike to the boundary of the estate. Here our kit was dumped while Hine and I walked to a Sakai village across the Bernam river and then on to a further Sakai 'kampong' half-a-mile on. We had to cross the swollen Bernam river singly in a small sampan, the seat of which collapsed while I was in midstream. Hine's shout: 'Be careful, the crocodiles here are awful' just as the sampan was rocking dangerously and shipping any amount of water did not tend to increase the comfort of my mind! Arranging with Sakais there to procure others as porters for the following day we returned to the estate. Shortly afterwards some

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of the estate Tamil coolies carried our kit across to the Sakai village (Buloh Seruvas). These Sakais are often referred to by the Malays as *'oran utan'*, literally 'people of the jungle', and this also is the meaning of the term used for the ape. I was interested to hear from Hine identically the same yarn as is to be heard in South India regarding the existence of Negrito Pygmies living on trees in the forest, never being seen by any one, and that the Sakais leave rice for them at the foot of trees, just as the jungle tribes in South India are supposed to do. I am convinced this is entirely a myth.

One of our Malay camp coolies developed a badly swollen face through coming in contact with a 'Rongas' tree. He certainly looked a pitiable sight with his face all swollen, eyes nearly closed and swellings on his neck and chest where he had spread the inflammation by scratching. The effect of touching the bark of this tree is similar to that of the Poison Ivy in America.

Most of the Sakais possess long blow-pipes and use them most skilfully, the poison on their darts being that of the 'Upas' tree as in North Burma and the Dutch East Indies, the tree in Malay being known as the 'Ipoh': probably the town of Ipoh draws its name from this tree.

Heavy thunderstorms were of daily occurrence. The loud and musical call of the Argus pheasant was frequently heard all day, as also the calls of the Seermangs and the 'Wah-Wah' or white gibbon.

Plane had put me on to the best anti-leech footgear I had hitherto seen; ordinary rubber boots with canvas uppers, tongue sewn to sides, and *cloth extensions up to just below the knee sewn into the boot.* Putties over this increase the life of the extensions and the whole is very effectively leech- and mosquito-proof.

These jungles lie directly under the mail-plane route between Europe, India, Burma, Siam, the Dutch East Indies and Australia. So used had the Sakais become to planes flying overhead that they did not deign to look up on hearing them.

We left our camp at Buloh Seruvas, having slept in a vacated Sakai's hut, and arrived at the Sakai village of Changkat Kereta, on the Erong river, in the evening. The going was not too bad but swampy in parts. Two or three old pits were passed, previously used by poachers for trapping rhino. Strangely enough this part of the forest between the Erong and Bernam rivers appeared to be leechless although conditions seemed to be favourable for them. The 'Jelutang' tree, the sap of which is tapped by the Chinese for the manufacture of chewing gum, occurs in these jungles. At Changkat Kereta I tasted my first Daurian, but I was quickly put off by the sickly smell without which the fruit would be quite palatable. Patches of Liberian coffee are cultivated round the Sakais' huts at Changkat Kereta, also pine-apples, sugarcane, plantains, cocoanuts, areca palms, betel vines and limes. In their clearings (the usual shifting cultivation of jungle tribes) the Sakais grow rice and Cassava (Tapioca). We hired a Sakai's house for ourselves at Changkat Kereta and decided

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Kroh River.



Sakai hut we occupied at Changkat Kereta (Base camp).

Photos by author.

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to make our base camp here. The headman's house was adorned with a large clock and four lamps, two being of the petrol type, one acetylene and the fourth an oil lamp: I think only the last was in working order! The headman was not very helpful at the outset, expressing fear that Sakais would not be available for shikar as they were all out cutting rattan. I felt sure that he was fishing for a present, and on learning from him on the following morning that he *hoped* to be able to supply six men he was told that there was to be no hoping and that we required *eight* men without fail. This firm attitude had immediate results and all the men we required were easily procured. We did not find the climate pleasant, it was like that of a hot-house. R was feeling far from well the whole time and I found that scratches and insect bites on my legs were apt to suppurate. I spent the next three days in searching the forest for miles around for *sondaicus's* tracks but without success, although tracks of *Rhinoceros sumatrensis* were quite common. Here and there patches of ground in the forest, about 12 ft. in diameter, swept clean by the Argus pheasant were to be seen, as also fresh tracks of the Malayan bear (in Malay '*bruan*', probably the origin of 'Bruin' for a bear). Small hornets were a common feature in these forests and our Sakai trackers were frequently stung. On one occasion we had to run from hornets for 200 or 300 yards much to the merriment of the Game Ranger Ngah who thought it was a great joke until he was stung on the neck when his mirth ended in a yelp! The Sakais, like nearly all jungle folk, possess a keen sense of humour and are a cheery crowd: crossing the Erong river on a fallen tree on the first day the leading Sakai was deposited into the river by the log breaking in two, much to the joy of the others. Pig-tailed monkeys (locally known as '*beroke*'—*Macacus nemestrinus*) were common, as also the white-eyed langurs, specimens of both being collected. When the weather is fine the dry parts of the interior of these forests are really beautiful, but their beauty would be better appreciated but for the myriads of mosquitoes and other insects that bite and sting, in which respect these forests must surely correspond to those of Brazil. The fruit of one of the jungle trees, somewhat similar in appearance to a mango and locally known as 'Poonti' was quite good eating, a little like a custard apple. The water in the small rivers in this area was bright red in colour, especially in the case of one stream where the water had the appearance of having been dyed with potassium permanganate, probably due to the fact that these rivers are fed by swamps, the water being coloured by the roots of trees and rotting vegetation. It is noticeable that many of the scientific names of fauna are actually the Malay names for the creatures concerned such as *Tupaia* (tree shrew) from '*Tupai*', the Malay word for a squirrel; *Rusa* (sambhur = *Cervus rusa*), the Malay name for sambhur. The word 'godown' used in India is probably derived from the Malay word '*godang*' (shed) and a 'compound' is said to be derived from '*kampong*' (village) though this may be open to doubt. The traps laid by the Sakais in the jungle are chiefly for the Chevrotain or *Tragulus* (mouse deer) known in

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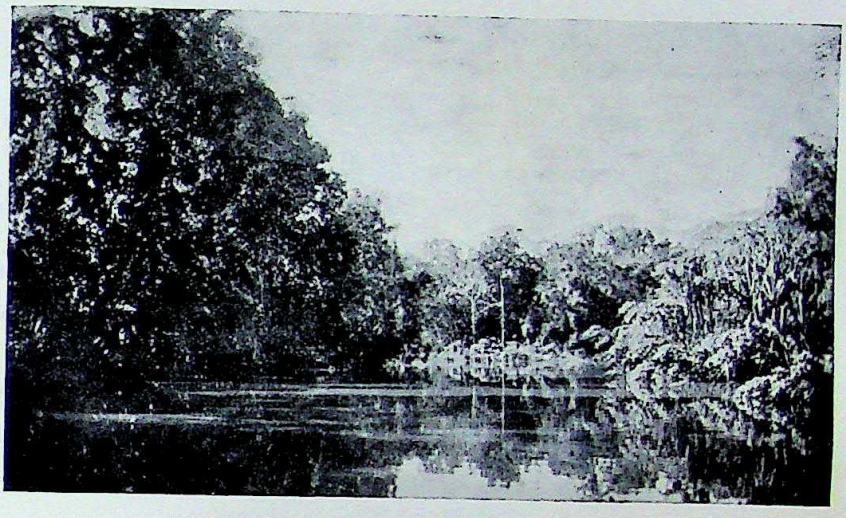
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Malay as 'Plandok', pheasant, and porcupine, the same trap serving for all: a wall of Zalacca palm leaves being placed on either side of, and across, a game path with a small doorway left for the victim to pass through straight into a noose. The undergrowth in large tracts of the forest is mainly Zalacca palm which adds a great deal to the beauty of the jungle. I noticed far less creepers and vines in these jungles than in similar type of forests in Upper Burma. In other parts the ground is covered by three or four species of plants with leaves akin to the Arum lily, and many of the swamps grow three species of tall and dwarf screw-pines. I came on the nest and eggs of a green forest-partridge one day having inadvertently disturbed this very beautiful bird. Sakais attach no value to empty bottles and tins and a lot of these can be seen thrown away round their houses.

On June 13th I left for my advanced camp, having had huts prepared in the forest some 12 miles north of Changkat Kereta, leaving R at our base camp. On my way I shot with my ·22 a fine specimen of a male seermang and sent it back to Raven. On arrival at my camp, on the upper reaches of the Erong, I had a bathe in the river while the Sakais completed a hut for themselves. That night I slept little being devoured by myriads of midges that invaded my mosquito curtain. For three days the jungle was searched for *sondaicus's* tracks without success. I had Sakais out in different directions quartering the jungle with the offer of a good reward for the discovery of a *sondaicus's* tracks. On the fourth day while some miles north-east of camp two Sakais caught me up and produced a 8½ in. stick which was declared to be the measurement of a fresh rhino track they had found. Although this was a bit small for a *sondaicus's* track I decided to follow it up. Returning to camp at noon I sent a Sakai to R with the information, and with Ngah and three men reached the spot where the rhino's tracks had been found 45 minutes later. The rhino's tracks had been found on a forest boundary separating the Chawang and Sungkei Reserves. Following up the tracks we eventually reached its wallow and from here on for a considerable distance the undergrowth through which the rhino had gone was caked with grey mud and our clothes were very soon similarly covered, and very much the worse for wear, following the rhino's path through rattan and Zalacca. Ngah's excellent tracking surprised me. We later came on a heap of the rhino's faeces, somewhat similar to a horse's droppings. It is well known to a rhino poacher that a rhinoceros is wont to return to the same spot to defecate, a habit it shares with some of the antelopes, and this, as often as not, leads to its destruction, the poacher occupying a machan over the spot. A rhino is worth Rs. 1,000 or more to the poacher, its chief value is in its horn, but every part of it possesses a definite value, including the blood, as an aphrodisiac. Shortly afterwards we came on the fresh tracks of a solitary elephant which sometimes covered the tracks of the rhino; and our difficulties were increased by a heavy thunder-storm which made it well nigh impossible to distinguish new from old rhino tracks. Added to this the light was becoming

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Bernam River. Boundary between Perak and Selangor States.



Camp in dense evergreen forest in the Bernam area.

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very poor and I abandoned the search for the day. Although I felt fairly sure that the tracks were those of a large *sumatrensis* I decided to have this confirmed. It took us two hours to reach camp and a large part of the going was perfectly poisonous, we were frequently up to our knees in mud and water. Early next morning I left with Ngah and two men sending the remaining Sakais on to the Chawang river to prepare a new camp. Taking up the rhino's tracks again we found at about mid-day that the tracks had led under a fallen tree under which it was obviously impossible for a *sondaicus* to pass. This settled the question beyond doubt and we found our way to the Chawang camp by compass bearing. Later in the day we returned to our first camp and found R had arrived, and that night we discussed our future plans. We both felt that there was little chance of our coming on the tracks of a *sondaicus*, and R decided to catch the P. & O. boat to Hongkong from Singapore on the 20th, which involved his leaving for Teloh Anson early on the following morning. The forest west and north-west of the Chawang river had still to be examined, and I did not wish to abandon the search until this had been done, although I felt there was very little hope of success. Further I now had low fever nearly every day, and my legs were in a bad state from suppurating scratches and insect bites. R left early next morning still feeling none too well. Soon after he left I shifted everything to the new Chawang camp and arrived there feeling unable to do any tracking that day. Ngah and the Sakai trackers were sent out to continue the search. 'Miowk', my gibbon, who had been my devoted companion all through, was stung by a hornet on a tree near the camp and retreated yelling. Ngah and his men returned in the evening without having found anything but new elephant and *sumatrensis'* tracks. The next day found me still feeling feverish, but I accompanied Ngah while the other trackers went off in different directions as usual. No success attended our efforts either this or the following day. As our search had fairly covered this last area I decided to strike camp and return to headquarters, Teloh Anson. We left the Chawang river camp next morning and reached Changkat Kereta that afternoon. Here I paid off the Malays and all the Sakais, retaining those of Buloh Seruvas to accompany me to Lima Blas estate on the following day. My heavy outfit I sent round by boat down the Erong and Bernam rivers to Utan Milantang in charge of Gabriel, my skinner, with instructions to engage carts or a lorry for the kit and himself, Ngah, and our hardworking camp boy Mahmet, to Teloh Anson. The camp supplies that remained over in the shape of tinned fruits, rice, sugar, salt etc. I divided up between the camp staff. That evening I went over to the headmans' house hearing music and much noise, and found the Malays and Sakais gambling away all their pay! One of the Sakais was playing a violin quite well.

Leaving Changkat Kereta next morning I walked, carrying my gibbon, with the Buloh Seruvas Sakais arriving there at about noon. Here we were greeted by two damsels. These two young

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ladies, pretty girls in their way, went through the most blatant vamping tactics, directed at Raven and myself on our previous visit to the village, strutting around in gay rags and faces covered with powder and to our surprise using lip sticks and mirrors. Their remark in passing 'We are following you, Tuan', an idiom in itself, evoked our reply that we were taking no camp followers.

The Sakais of Malaya are considered to be the surviving representatives in the Malay Peninsula of the Indo-Malayans, as the Nagas, Kachins, Chins, Wahs, etc. are in Burma and Assam. The Tarajas of the Celebes, the Dyaks of Borneo and the hillmen of the mountains of Formosa and Philippines exhibit many of the same characteristics, have many of the same customs, and even similar words in their languages and nearly all are spirit worshippers. The 'Nat' poles, topped with funnel-shaped caskets, of the Burma races have very similar counterparts with the races of Malaya, the Dutch East Indies, Formosa and the Philippines.

A message that I was returning to Lima Blas had been sent on ahead and Hine met me between the Bernam river and the estate boundary. Arriving at Iversen's bungalow I arranged to leave for Teloh Anson the same evening in a hired car. Cars and lorries can be hired in Malaya at just about one-third of the rates in India. I reached Teloh Anson in what must have been almost record time, the driver being of the reckless speed-fiend type. Back in Teloh Anson I felt considerably better although pretty tired with my long day. The forests we had been through were, except for a few *sumatrensis*, tapir, pig, bear and elephant well-nigh gameless as was our experience in most of the evergreen forests of Upper Burma.

The next day was spent in drawing out funds from the Bank, in farewell visits to Mr. and Mrs. de Moubray and Mr. Ferguson and in re-sorting and packing up my outfit. My skinner Gabriel, Ngah, and Mahmet having turned up at noon I left the same evening on the s.s. *Krian* and arrived at Penang at 9 a.m. on the following morning. After making arrangements for the transfer of my luggage to the Madras boat, the s.s. *Rohna*, I spent the morning in Penang getting tickets for passages (Mahmet to Rangoon) and export licenses for my weapons. The s.s. *Rohna* sailed at 2 p.m. and the shores of Penang and Malaya were soon out of sight. Our route lay close in to the shores of Sumatra which we finally left behind us at noon on the following day. Our arrival at Madras on June 30th brought to a close an expedition which, though unsuccessful in its main object, was both interesting and instructive.

A further attempt to procure a specimen of a *Rhinoceros sondaicus* will probably be made in Sumatra where this species still exists.

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THE INDIAN CADDIS-FLIES (*TRICHOPTERA*).

BY

MARTIN E. MOSELY, F.R.E.S.

(*With* 16 *text-figures and* 18 *plates*).

PART IV.

(*Continued from page* 133 *of volume* XXXVIII).

LIMNOPHILIDAE.

Kolenati.—Gen. et Spec. Trich., vol. ii, p. 29, 1859.

CHARACTERS OF THE FAMILY.

Antennae as long as (rarely longer than or slightly shorter than) the wings, moderately stout, the basal joint bulbose. Ocelli always present. Maxillary palpi three-jointed in the male, five-jointed in the female, similar in structure in both sexes, only slightly pubescent, the basal joint short. Labial palpi small, the end joint often concave. Legs usually rather long; tibial spurs varying greatly, but the anterior tibiae are either spurless or have only one (apical) spur (excepting in *Astratus* where there is an unusually formed double black spur) and the intermediate have never more than three; tibiae and tarsi usually with strong spines. Abdomen generally short and robust; the margin of the eighth segment often produced. The appendages of the male tolerably constant in general character; that is to say, there is a pair of (ordinarily) small superior appendages, a pair of (ordinarily) lanceolate intermediate appendages, and a pair of inferior appendages, often fused to the ninth segment. Between these appendages is placed the penis which is usually short and cylindrical and generally accompanied by a pair of sheaths which are often bifid or pectinate.

In the female the ninth segment is nearly always visible both dorsally and ventrally; above, it is generally accompanied by a pair of pubescent appendages, and below them there is ordinarily a testaceous tubular piece open in front. On the surface of the eighth ventral segment is the vulvar scale which is generally trifid, consisting of two side lobes and a more or less tongue-shaped median lobe.

Wings usually ample and only slightly pubescent; but sometimes there is a close dense pubescence and the membrane may be granulose and with long erect hairs which are more frequently confined to the veins. Normally the neuration is similar in both sexes. In the anterior wing, the discoidal cell is always closed (excepting in one or two aberrant forms); the sub-costa ends usually in the costa but in one sub-family it ends abruptly in

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transverse nervule between the costa and radius; there is no median cellule and the cellula thyridii is always long and narrow; four basal cellules; the anastomosis is usually divided into two portions, the lower placed nearer the base of the wing than the upper but in some genera both portions are nearly in line; there are nine apical cellules, and forks Nos. 1, 2, 3 and 5 are present. The posterior wings are shorter and much broader, and broadly folded; the anal portion usually well developed: discoidal cell usually closed (but open in one group); eight apical cellules and forks Nos. 1, 2, 3 and 5 present.

There are three very anomalous genera which, however, have not as yet been recorded in the Indian fauna, *Anomalopteryx*, *Thamastes* and *Enoicyla;* of these the first two depart widely in their neuration from the general form, with rudimentary posterior wings, and, in *Enoicyla*, the female insect is to all intents and purposes, apterous.

There are several female examples in the British Museum and the author's collections belonging to the *Limnophilinae*. I refrain from naming these as it is very probable that some at least may be associated with males either already described or perhaps described here as new.

Sub-families.

Limnophilinae Ulmer.

Apataniinae Ulmer.

Characters of the Sub-families.

1. In the anterior wing, the sub-costa continues to the costal margin. Limnophilinae Ulm. (Text-fig. 1).

2. In the anterior wing, the sub-costa ends in a cross-vein joining the radius and costal margin. Apataniinae Ulm. (Text-fig. 14).

Limnophilinae Ulmer.

Limnophilinae Ulmer.—Ab. Natur. Ver. Hamb., xviii, pp. 42, 46, 1903.

The sub-family of the *Limnophilinae* contains most of the Indian *Limnophilid* genera, and might well be further subdivided in a work having a world-wide range. There are objections, however, to the creation of sub-families to deal with the fauna of a particular region, so I shall therefore restrict myself to the collecting together of certain genera into two groups in the hope that this course may render easier the study of the Indian *Limnophilinae*.

First will come the group of *Colpotaulius*, characterised by the formation of the anterior legs of the male, which differ from those of the female in having a deep groove along the femora lined with short black setae, and in the genera *Colpotaulius* and *Astratus*, having peculiarly shaped black spurs. In *Astratodina* the groove is present, but there are no spurs.

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The remaining genera will not fit comfortably into a single group although most of them follow closely the pattern of Martynov's *Pseudostenophylax*.

I omit the European genus *Stenophylax* from my tables. Navás has described an Indian species in this genus. I am unable to recognise it from the description, and I think it doubtful in the extreme that the genus is really *Stenophylax* as we know it in Europe.

TABLE OF THE INDIAN LIMNOPHILINAE GENERA.

1. Insects in the male with a groove lined with black setae on the anterior femora, generally with a specialised black spur on this leg; female leg normal. (*Colpotaulius* group) 2
—Anterior leg of the male without the groove or specialised spur. 4

2. No specialised spur on the anterior leg. ASTRATODINA gen. nov. p. 450
—One or more specialised spurs on the anterior leg. 3

3. A single specialised black spur. COLPOTAULIUS Kol. p. 451
—Paired black spurs. ASTRATUS McLach. p. 452

4. In the male, first joint of the anterior tarsus much shorter than the second; discoidal cell in both sexes strongly excised along its upper margin. MICROPTERNA Stein p. 454
—In the male, first joint of the anterior tarsus not shorter than the second. 5

5. In the male, posterior wing with specialised scales or specialised hairs. 6
—Male posterior wing without such scales or hairs. 7

6. Scales or hairs in the anal region of the posterior wing either entirely or partly along A_2. PSEUDOSTENOPHYLAX Mart. p. 455
—Scales or hairs along the region of the sector. ASTENOPHYLODES gen. nov. p. 458

7. Posterior wing of the male with a strong triangular anal projection. STENOPHYLINA Mosely p. 460
—Posterior wing of the male normal. 8

8. All the tergites covered with long silky hairs. TRICHOPHYLAX gen. nov. p. 461
—Tergites normal. 9

9. Anterior wing of the male with a mass of black setae occupying the basal half of the costal area. PSEUDOHALESUS Mart. p. 462
—Anterior wing of the male without such setae. 10

10. Distal margin of the anterior wing undulating, neuration of the male posterior wing abnormal with only fork No. 5 present. HALESINUS Ulm. p. 465
—Margin of the anterior wing not undulating; posterior wing of the male normal. 11

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11. Spurs 1, 2, 2. 12
—Spurs 1, 3, 4. 13

12. Fork No. 3 of the posterior wing passes the cross-vein at its apex. PLATYPHYLAX McLach. p. 467
—Fork No. 3 of the posterior wing meets the cross-vein at its apex. PHYLOSTENAX Mosely p. 468

13. Superior appendages very long, blade like (see Text-fig. 11). ANABOLIA Steph. p. 470
—Superior appendages not so long. 14

14. Discoidal cells of both wings much longer than their footstalks. STENOPHYLIELLA gen. nov. p. 471
—Discoidal cells of both wings shorter or as long as their footstalks. ASTENOPHYLINA gen. nov. p. 473

Astratodina gen. n.

Closely allied to *Colpotaulius* and *Astratus* but the ♂ without the specialised spurs on the anterior legs.

Antennae slender, about the length of the anterior wings, basal joint large and rounded, particularly on the inner side, next joint short; maxillary palpi ♂, first joint short; second long, about four times the length of the first; third slightly shorter than the second; ♀, basal joint short, about half the length of the second; third slightly longer than the second; fourth slightly longer than the first; fifth about as long as the second. Anterior wings elongate, costa somewhat rounded, apex sub-acute discoidal cell long (in both anterior and posterior), membrane granulose; legs differing in the sexes; ♂ with the anterior formed as in *Astratus* but without spurs, femora with a groove lined with black setae which are present also on the tibiae; first tarsal joint more than twice the length of the second; spines black, no spines on the terminal tarsal joints; spurs 0, 2, 2 ♂; 1, 2, 2 ♀.

Genotype: *Astratodina inermis* sp. n.

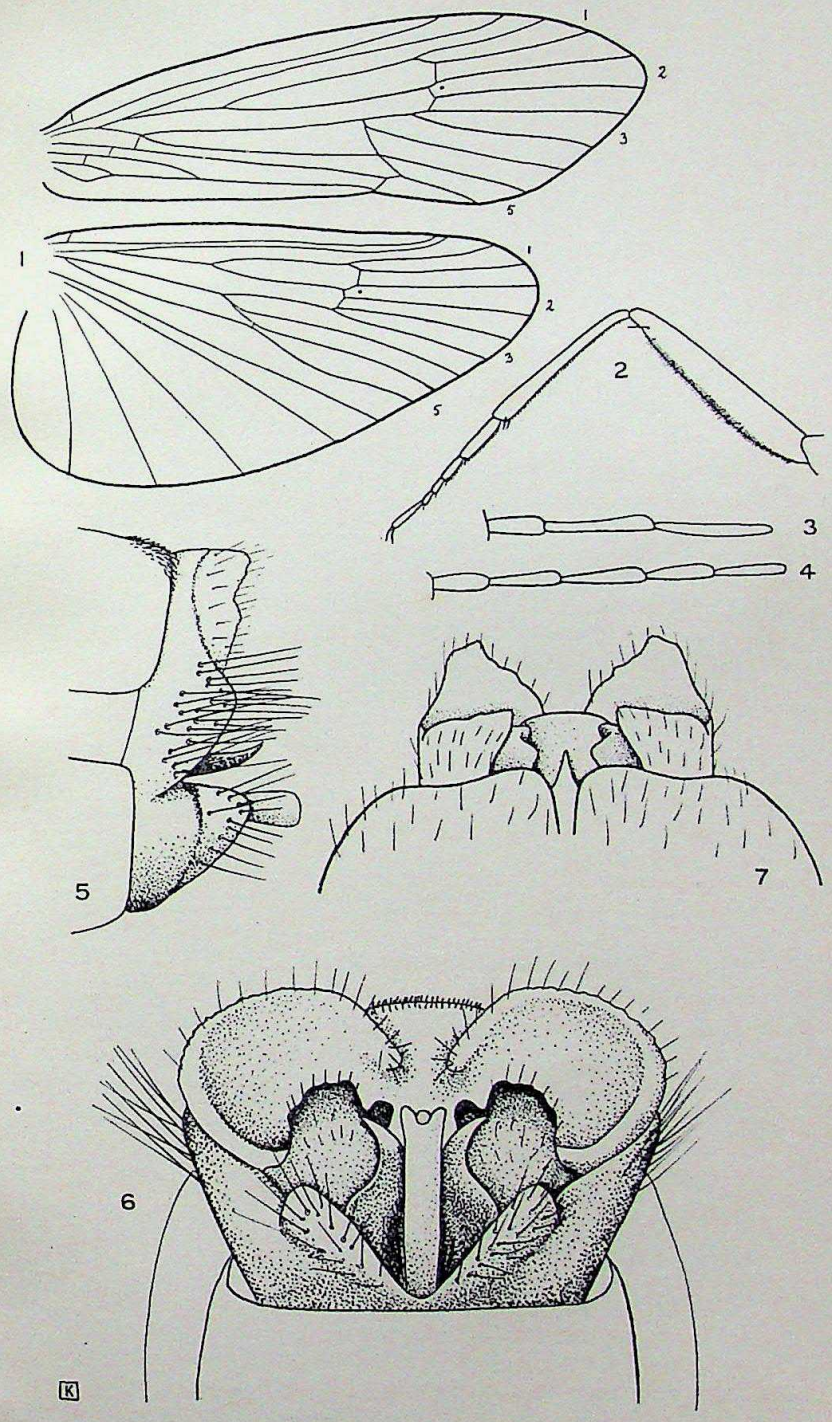
Astratodina inermis sp. n. (Pl. I, figs. 1-7).

Head dark fulvous, antennae lighter in colour than the head with still paler annulations; palpi and legs, pale fulvous; the anterior femur carries a single black spine (not a spur) on its outer surface towards the apex. Anterior wing elongate, cinereous with yellowish irrorations, membrane granulose with short yellowish hairs, fringes yellowish; neuration inclined to aberrancy, in one example the second and third apical sectors are bent inwards towards each other and united on one side by a cross vein, in others, neuration is normal.

Genitalia ♂.—Margin of the eighth dorsal segment rounded and set with short black setae; superior appendages are welded to the ninth segment making a pair of large rounded processes as seen from above; the ninth segment towards the centre of its lateral margin is heavily fringed with long stout bristles; from behind may be seen a pair of broad, strongly chitinised intermediate appendages, apices truncate, slightly serrate and deeply

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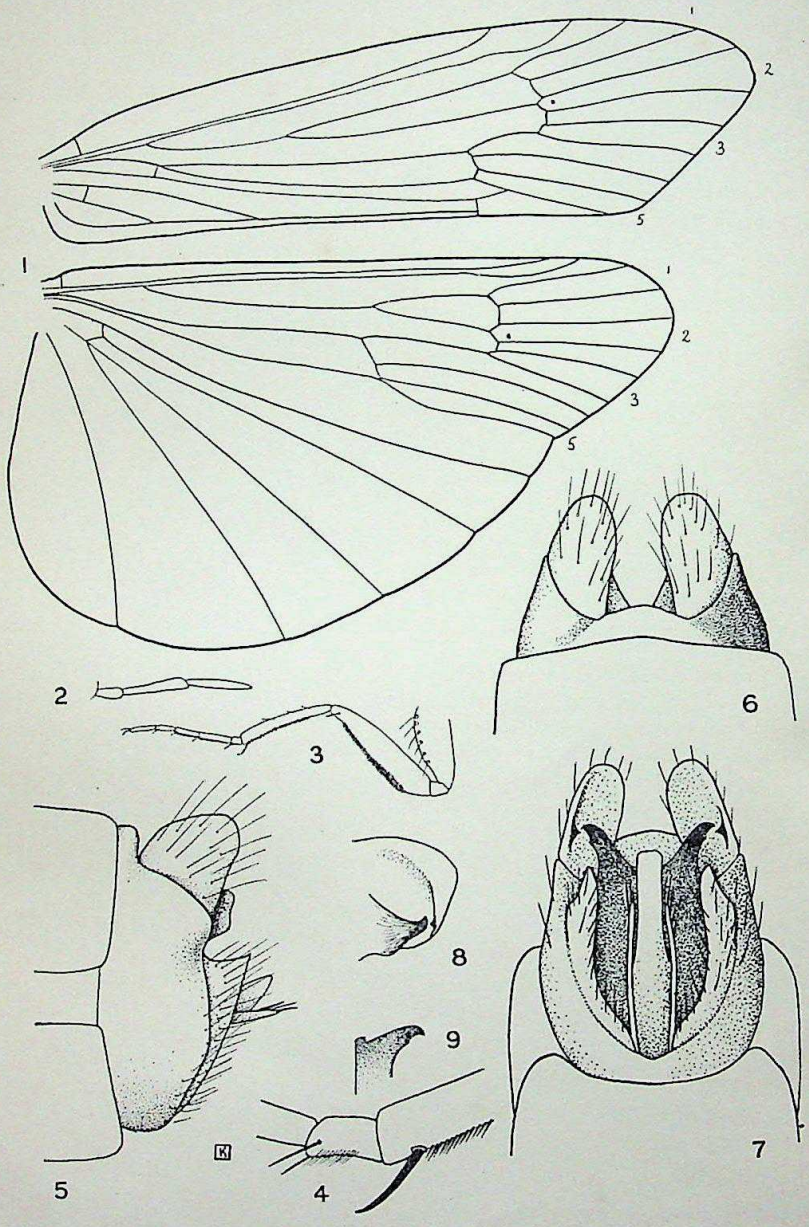
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Astratodina inermis sp.n., Fig. 1, wings ♂. Fig. 2, anterior leg ♂. Fig. 3, maxillary palpus ♂. Fig. 4, maxillary palpus ♀. Fig. 5, genitalia ♂, lateral. Fig. 6, ventral. Fig. 7, genitalia ♀, ventral.

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Colpotaulius major Mart., ♂. Fig. 1, wings. Fig. 2, maxillary palpus. Fig. 3, anterior leg. Fig. 4, specialised spur enlarged. Fig. 5, genitalia, lateral. Fig. 6, dorsal. Fig. 7, from behind. Fig. 8, superior appendage with apex of intermediate appendage, from within. Fig. 9, apex of intermediate appendage from behind.

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notched towards their inner margins; penis-sheaths very strong and heavily chitinised, bases broad, apices acute, curving outward on each side of the penis which is short and straight; inferior appendages small and rounded, thickly beset with strong hairs and projecting only slightly beyond the ninth segment to which they appear to be welded.

♀.—The surface of all the dorsal segments set with minute setae, rather longer at the apical margin of the eighth; beyond this segment are two broad triangular processes with the inner margins somewhat serrate and carrying small rounded forks at their bases as seen from above; as seen from beneath, the processes are continued in broad inturned plates of which the inner apical angles appear as pointed projections; vulvar scale with two broad wings and a small and acute inner process; previous segment deeply and narrowly excised in the centre of its apical margin.

Length of anterior wing ♂ 12 mm.

Length of anterior wing ♀ 16 mm.

Western Tibet; Lhabaps, ft. 11,855, 23-vi-1932 G. E. Hutchinson, Yale North India Expedition.

Type ♂ and paratype ♀ in the British Museum collections, other paratypes ♂ and ♀ from the same locality in the collections of the Yale University, United States of America.

Colpotaulius Kol.

Colpotaulius Kolenati.—Gen. et Species Trichop., pt. 1, p. 47, 1848; McLachlan.—Rev. & Syn. Trich., p. 34, 1874; Ulmer.—Gen. Insect., fasc. 60a, p. 36, 1909.

Maxillary palpi ♂, basal joint less than half the length of the second which is slightly longer than the third; spurs 1, 3, 4 ♂ ♀ but that on the anterior tibia of the ♂ is differently formed to the equivalent spur in the ♀ being intensely black, sometimes long and thin with merely the apex slightly curved, sometimes stout and curved resembling a strong spine. First joint of the anterior tarsus in the ♂ only half the length of the second, whereas in the ♀ it is nearly one-third longer than the second. Tibiae with few spines on the anterior but they are more numerous on the two other pairs and on the tarsi; the anterior legs of the ♂ short and stout, the tibia fitting into a groove on the inner side of the femur, this groove being clothed with short and dense black setae. Antennae about the length of the wings, moderately stout. Anterior wings elongate with moderately dense short pubescence and evident apical fringe, costal margin gently rounded, the apex sub-acute; discoidal cell very long and narrow; no marked pterostigma. Posterior wings very deeply incised below the apex at the point where the lower branch of the cubitus terminates.

Genotype: *Colpotaulius incisus* Curt.

Colpotaulius major Mart. (Pl. II, figs. 1-9).

Colpotaulius major Martynov.—Zool. Jahrb. Bd. xxvii, pp. 516-8, pl. 24 figs. 1-4, 1909.

C. incisus Curt. n. var. Martynov.—Ann. Mus. Zool. ac. sci. U.R.S.S., vol. xxvi, p. 24, Pl. II fig. 9, 1925.

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Head and thorax clothed with yellowish-grey hairs; antennae brownish testaceous with light-ochraceous annulations. Wings yellowish with brownish markings; under-surface of the anterior femora of the ♂ set with close black hairs, the abnormal single spur of this leg long, black and slightly curved at the tip.

Genitalia ♂.—Margin of the ninth dorsal segment slightly produced and rounded; superior appendages from above, large, obscuring all the rest of the genitalia excepting the inner margins of the intermediate appendages; the lower margin of each appendage is produced at its centre in a short, blackened, triangular, inturned spur; intermediate appendages from the side, broad at the bases terminating in acute blackened apices (hidden by superior appendages); from beneath, the appendages are directed slightly outward and are notched towards the inner angles of their apical margins so that they resemble a pair of boots placed heel to heel with the soles directed upwards and the toes well turned out; penis straight, apex blunt; penis-sheaths long and slender, apices pectinate; inferior appendages welded to the ninth segment; from the side, triangular, only slightly projecting beyond the line of juncture with the segment; from beneath, with only the apical third free and distinct from the segment, apices acute.

Length of anterior wing ♂ 12 mm.

Kashmir, Caucasus, Kamtshatka.

In the Ann. Mus. Zool. Ac. Sci., 1925, Martynov describes from Kamtshatka, a *Colpotaulius* as a variety of *C. incisus* Curt. The genitalia as figured differ far too widely from those of Curtis's species for the Kamtshatka insect to be associated with it even as a variety. On the other hand, the figures of these parts are indistinguishable from those given with the description of *C. major* and I conclude, in spite of the wideness of the range that the so-called variety is in fact this species.

Astratus McL. (Text-figs. 1-3).

Astratus McLachlan.—Rev. and Syn. Trich., p. 36, 1874; Ulmer.—Gen. Insect., fasc. 60a, p. 37, 1907.

Maxillary palpi ♂, first joint about two-thirds the length of the second which is slightly longer than the third.

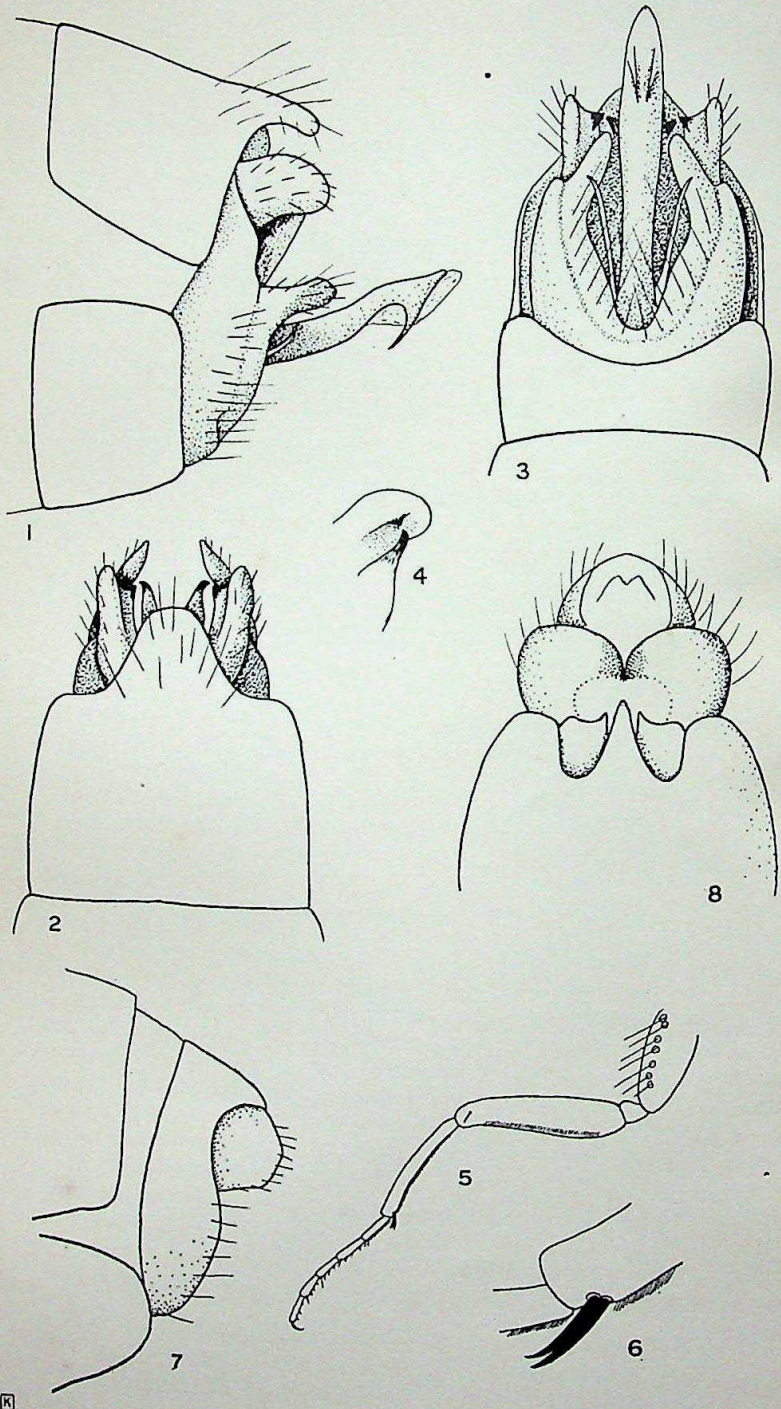
Maxillary palpi ♀, first joint about two-thirds the length of the second which is slightly shorter than the third, fourth as short as the first, fifth as long as the third; anterior wings elongate with moderately short pubescence; discoidal cell long and narrow; posterior wings somewhat excised below the apex; spurs ♂, 2, 3, 4 or 2, 3, 3, ♀ 1, 3, 4 or 1, 3, 3; anterior legs differing in form in the two sexes; in the male, femora broad, lower margins of the femora and tibiae lined with fringes of short black setae; spurs 2 in number, long, black, slightly hooked at the apices and set closely together in juxtaposition so that the presence of a second spur may easily be overlooked; first joint of the tarsus much longer than the second; in the female, the anterior leg normal with a single normally formed spur and no fringes of black setae; in the ♂ margin of the eighth dorsal segment strongly produced at its centre with the extreme apex generally fringed with short

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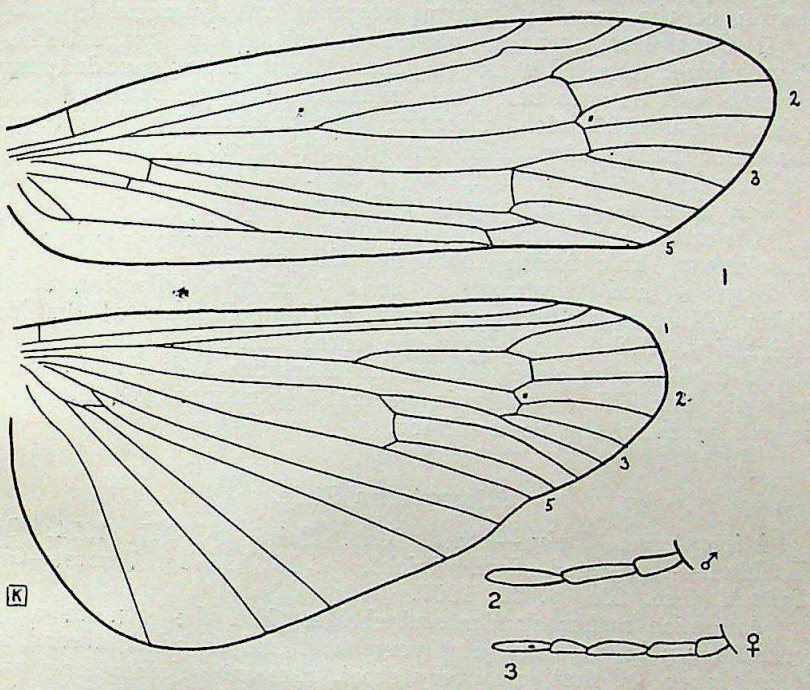
Astratus tricalcaratus sp.n., ♂. Fig. 1, genitalia, lateral. Fig. 2, dorsal. Fig. 3, ventral and from behind. Fig. 4, superior appendage with apex of intermediate appendage, from within. Fig. 5, anterior leg. Fig. 6, specialised spurs of the anterior leg, enlarged. Fig. 7, ♀ genitalia, lateral. Fig. 8, ♀ genitalia, ventral.

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black setae; inferior appendages welded to the sides of the ninth segment.

Genotype: *Astratus asiaticus* McL.



Figs. 1–3. *Astratus tricalcaratus* sp.n., Fig. 1, wings ♂. Fig. 2, maxillary palpus ♂. Fig. 3, maxillary palpus ♀.

Astratus tricalcaratus sp. n. (Text.figs. 6-7; Pl. X, figs. 1-3).

Head testaceous, oculi dark testaceous, antennae of the same colour with darker annulations. Wings long, narrow, greyish, nervures dark; spurs ♂ 2, 3, 3, ♀ 1, 3, 3; spurs of the anterior leg ♂ as detailed in the generic description.

Genitalia ♂.—The apical margin of the eighth dorsal segment is strongly produced at the centre but there is no mat of short black setae lining the extreme apex; superior appendages from above, rather long; to each appendage there is an inner ridge carrying a stout spur whose extreme apex is blackened; this spur may be seen, both from above and beneath, projecting beyond the inner margin; from the side, the appendage is broad, broader at its base; intermediate appendages from the side, concealed by the superior appendage; they are very broad at the bases narrowing to strongly chitinised blackened and slightly hooked apices directed upwards and, from above, slightly outward; penis from the side deeply notched on the underside before the apex which carries two slender spines on its underside directed

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downwards and towards the base; penis-sheaths long and slender, curving slightly upwards from the side, divergent from beneath; inferior appendages welded to the sides of the ninth segment; from above narrow, apices directed slightly inward; from the side, the apices appear slightly twisted; lower margins strongly fringed; margin of the terminal ventral segment widely excised.

♀ General appearance resembling that of the ♂; genitalia.—From above, terminal dorsal segment produced and rounded; from beneath, can be seen below this segment two large rounded lobes; vulvar scale with a slender central piece extending slightly beyond the outer lobes whose apical margins are sinuous.

Length of anterior wing ♂ 9 mm.

Length of anterior wing ♀ 9.5 mm.

Western Tibet; Pangur Tso, 14,203 ft., 13-14-viii-1932, G. E. Hutchinson, Yale North India Expedition.

Type ♂ and paratypes ♂ and ♀ in the collection of the British Museum; other paratypes in the collection of the Yale University, U.S.A., all from the same locality.

A. tricalcaratus closely resembles Martynov's *A. alaicus* in the genitalia but differs vastly in general appearance and in having only 3 spurs to the posterior leg.

Micropterna Stein.

Micropterna Stein.—Stett. Ent. Zeit., p. 247, 1874; McLachlan.—Rev. and Syn. Trich., p. 137, 1874; Ulmer.—Gen. Insect., fasc. 60a, p. 53, 1907.

Antennae rather slender and shorter than the anterior wings; maxillary palpi ♂, first joint very short and rounded, second and third long; ♀, first joint very short, remaining joints long, with the fourth slightly shorter than the others. In the anterior tarsi of the ♂, the basal joint is very much shorter than the second joint and is sometimes thickened; spurs generally 0, 3, 4 or 0, 3, 3 in the ♂ and 1, 3, 4 in the ♀ but in the single described Indian species, the spurs are doubtful and appear to be 0, 2, 2 in the ♂ and 1, 2, 2 in the ♀. Anterior wings ordinarily elongate and broad with the apices sometimes rounded, sometimes sub-acute, costal margin more or less arcuate, pterostigma as a rule absent, discoidal cell strongly excised on its upper edge, first apical cell somewhat rounded at the base, third and fifth sub-acute, second and fourth slightly truncate; posterior wings broad, not perceptibly excised below the apex; the margin of the eighth dorsal segment is generally inturned and densely clothed with short black setae.

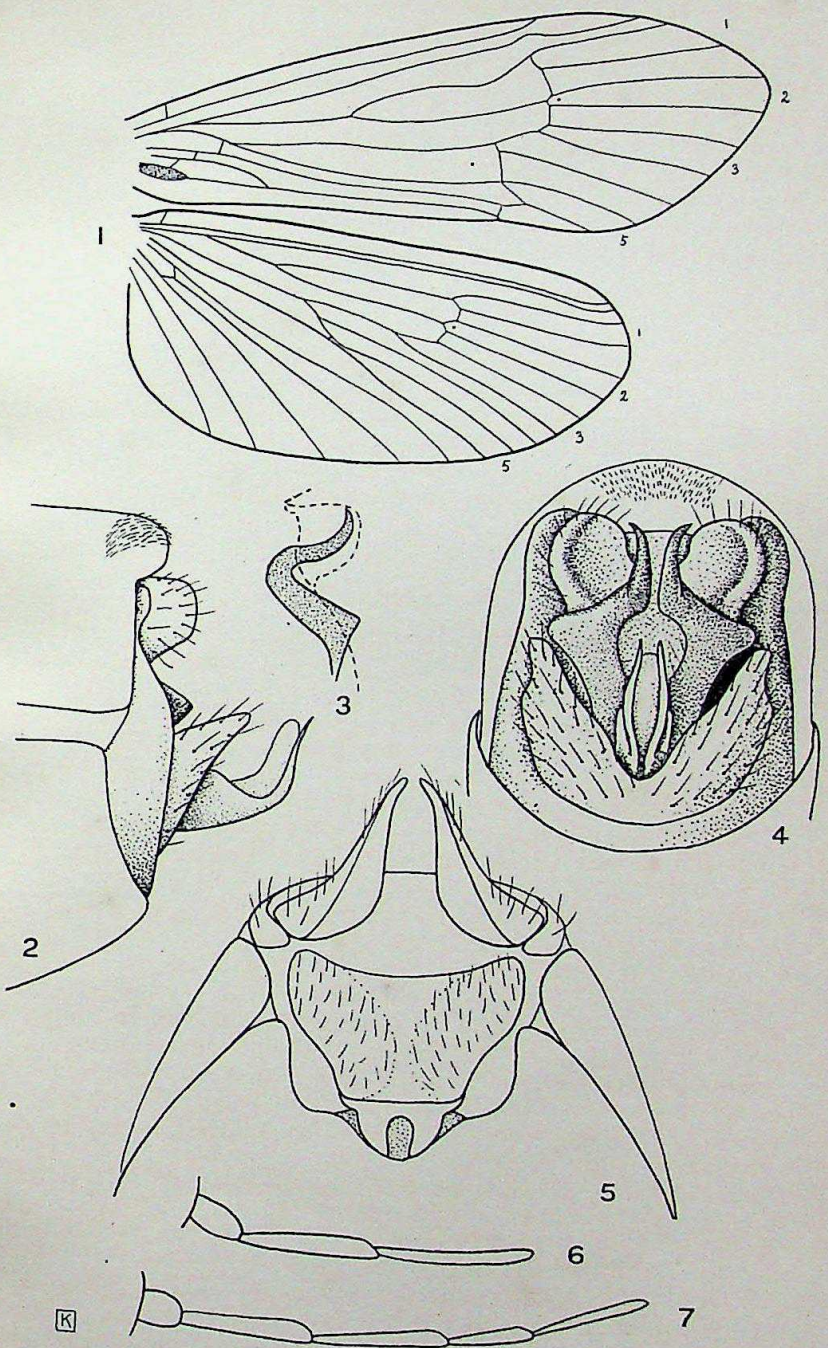
Genotype: *Micropterna testacea* Gmelen.

Micropterna indica sp. n. (Pl. IV, figs. 1-7).

Head ochraceous, antennae ochraceous, long and slender, palpi of the same colour; mesothorax ochraceous in the centre with wide black patches on each side; metathorax with two rounded black patches. Wings large, anterior rather long, apex sub-acute, pale stramineous, rather darker along the costa and sub-costa

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Micropterna indica sp.n., Fig. 1, wings ♂. Fig. 2, genitalia ♂, lateral. Fig. 3, portion of intermediate appendage, lateral. Fig. 4, genitalia ♂, from behind. Fig. 5, genitalia ♀, ventral. Fig. 6, maxillary palpus ♂. Fig. 7, maxillary palpus ♀.

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and towards the pterostigma which is only slightly indicated; in both sexes there is a narrow cell towards the base pigmented entirely with dark ochraceous; posterior wing broad, pale ochraceous. Legs ochraceous. Spurs of the anterior legs, 0 in the ♂ and 1 in the ♀; on the median and posterior legs doubtfully 2 in both sexes.

Genitalia ♂.—Margin of the eighth dorsal segment truncate and set with a close mass of rather pale coloured setae as compared with the black setae of most European species in the genus; superior appendages small and rounded, not visible from above and appearing as rounded lobes from the side; intermediate appendages only visible from behind, stout, black, their centres approximating each other, apices directed outward, bases diverging widely; penis slender, sheaths very slightly longer than the penis; as seen from the side, broad at the base narrowing abruptly at the centre and from there directed upward in a slender spine; inferior appendages from the side, wide at the base and tapering rather suddenly to a blunt apex.

Genitalia ♀.—From beneath, the abdomen terminates in a pair of finger-like processes, broad at their bases, apices acute; below these are two reniform, strongly chitinised hairy plates towards the base of which is the vulvar scale with broadish wings and a small central lobe.

In both sexes the margins of the sixth and seventh ventral segments are set with minute teeth.

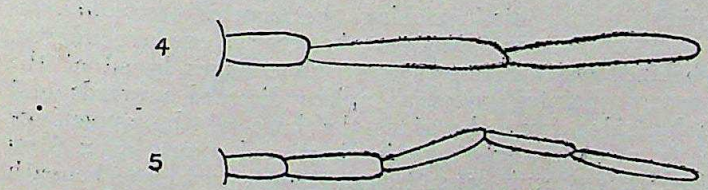
Length of anterior wing ♂ 18 mm.

Length of anterior wing ♀ 20 mm.

Type ♂ and paratype ♀ taken coupled, Kashmir, ft. 5,600, Khanabal, 20-ix-1923, Dutt. Coll. from the collection of the Imperial Institute of Agricultural Research, Pusa, Bihar, now in the collection of the British Museum.

Pseudostenophylax Mart. (Text-figs. 4-5).

Pseudostenophylax Martynov.—Ann. Mus. Zool. Acad. Imp. St. Peters, vol. xiv, pp. 281-2, 1909; Proc. Zool. Soc. Lond., Pt. I, No. 6, pp. 91-2, 1930.



Figs. 4–5. *Pseudostenophylax himalayanus* Mart., Fig. 4, maxillary palpus ♂, Fig. 5, maxillary palpus ♀.

♂ Maxillary palpi slender, first joint short, second and third more than twice the length of the first. ♀ first joint short,

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second nearly twice its length, third and fifth longer than the second, fourth as long as the second. Spurs 1, 3, 4. Terminal joint of each tarsus without spines (or with two or three very short ones only); anterior wings broad, rounded at the apices, greyish-yellow or testaceous with yellow spots; nervures strong; membrane granulose with very short semi-erect hairs; discoidal cell very long, much longer than its foot-stalk. Posterior wings sub-hyalin, posterior margin excised in the region of fork No. 5, fourth apical cell as broad as the second; in the anal region of the ♂ wing there are specialised hairs or scales.

Genotype: *Pseudostenophylax fumosus* Mart.

Pseudostenophylax martynovi sp.n. (Pl. V, figs. 1-6).

Pseudostenophylax himalayanus Martynov *partim*.—Proc. Zool. Soc. London, Part I, No. 6, pp. 92-5, figs. 37-41, 1930.

Head dark ochraceous, antennae and palpi pale ochraceous; wings, anterior, brownish irrorated with round yellowish spots; membrane granulose with numerous semi-erect and very fine black hairs and with a mass of dense black hairs fringing the costa making a narrow black rim to the costal margin. There is a dense mass of black hairs in the subcostal region at the base of the wing. Membrane of the posterior wing finely granulose, covered with small semi-erect dark hairs; at the base of the second anal vein is a long, rather broad yellowish area free from hairs but set transversely with some wide yellowish wax-like scales, the structure of which is very obscure. There is no fringe of scales clothing the second anal vein as in *himalayanus* and the yellowish area is confined to basal third of the vein. Basal portion of the wing deeper in proportion to its length than in *himalayanus*.

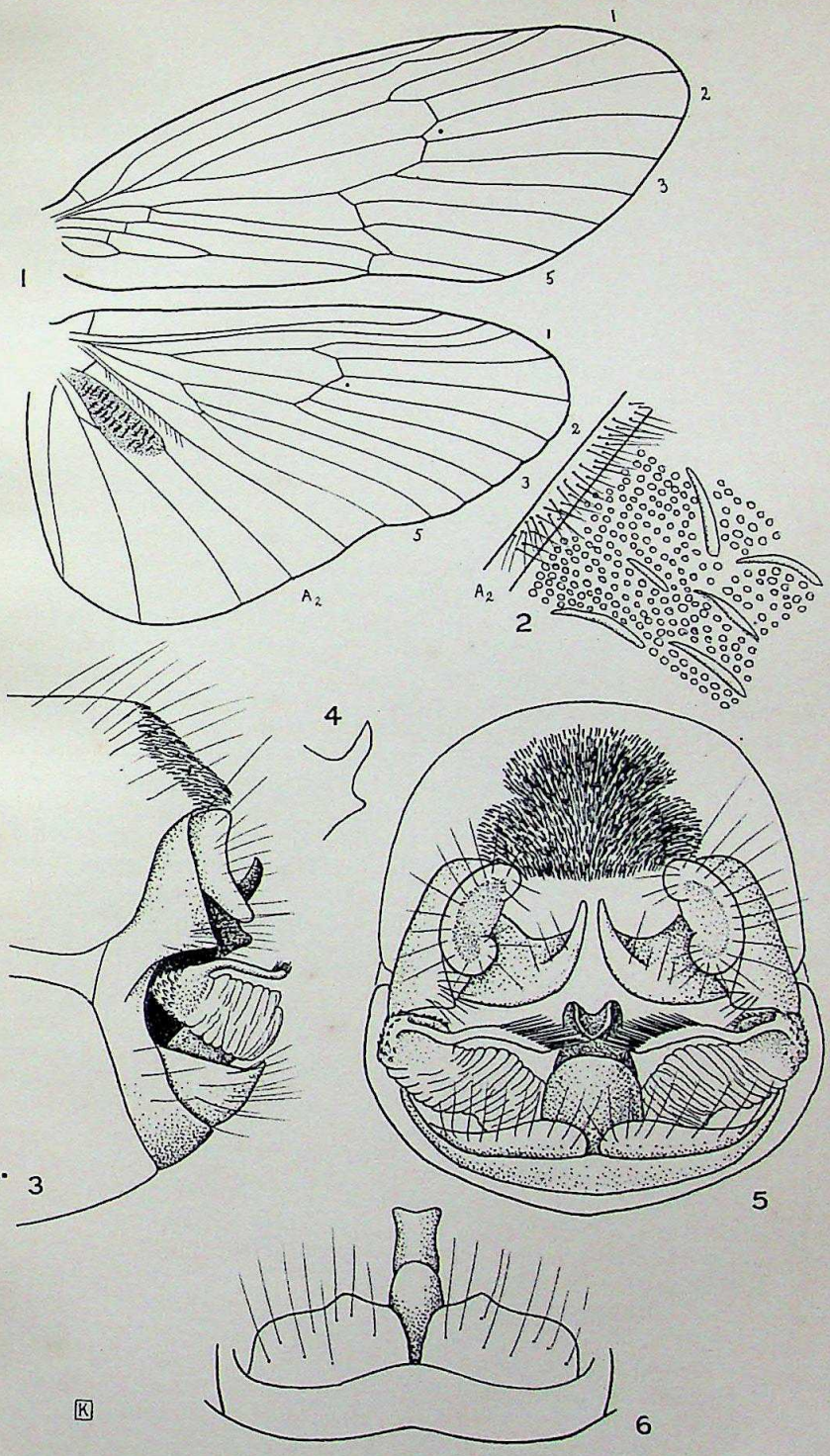
Genitalia ♂.—The margin of the eighth dorsal segment is produced and clothed with a dense mat of black setae which continue not very far round to the under side; there is a raised centre portion of the margin also densely covered with black setae. Side-pieces of the ninth segment triangular with acute apices; superior appendages from behind, ear-shaped, margins fringed with long black hairs; from the side, deep and narrow, apical margin concave, distinguishing the species from *himalayanus* in which the margin is convex; between these appendages, seen from behind, are the intermediate appendages broad at the base with narrow, pointed yellowish apices directed upwards and placed side by side; from the side, the base of the appendage projects nearly at right-angles; penis short and stout, apex from behind excised; lower penis-cover trough-shaped, set close beneath the penis; penis-sheaths with broad membranous bases and narrow strongly chitinised terminal portions bent inwards horizontally. apices furnished with stiff bristles; inferior appendges small and broad, margins fringed with long hairs and bearing slight projections towards the inner angles as seen from beneath; from the side, broad at the base, apex produced in a small blunt finger.

Length of anterior wing ♂ 21 mm.

Tibet; Yatung, 4,500 ft., A. E. Hobson.

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Pseudostenophylax martynovi sp.n., ♂. Fig. 1, wings. Fig. 2, anal area of left posterior wing showing scales, enlarged. Fig. 3, genitalia, lateral. Fig. 4, apex of intermediate appendage, lateral. Fig. 5, genitalia, from behind. Fig. 6, inferior appendages, penis and lower penis cover, etc., ventral.

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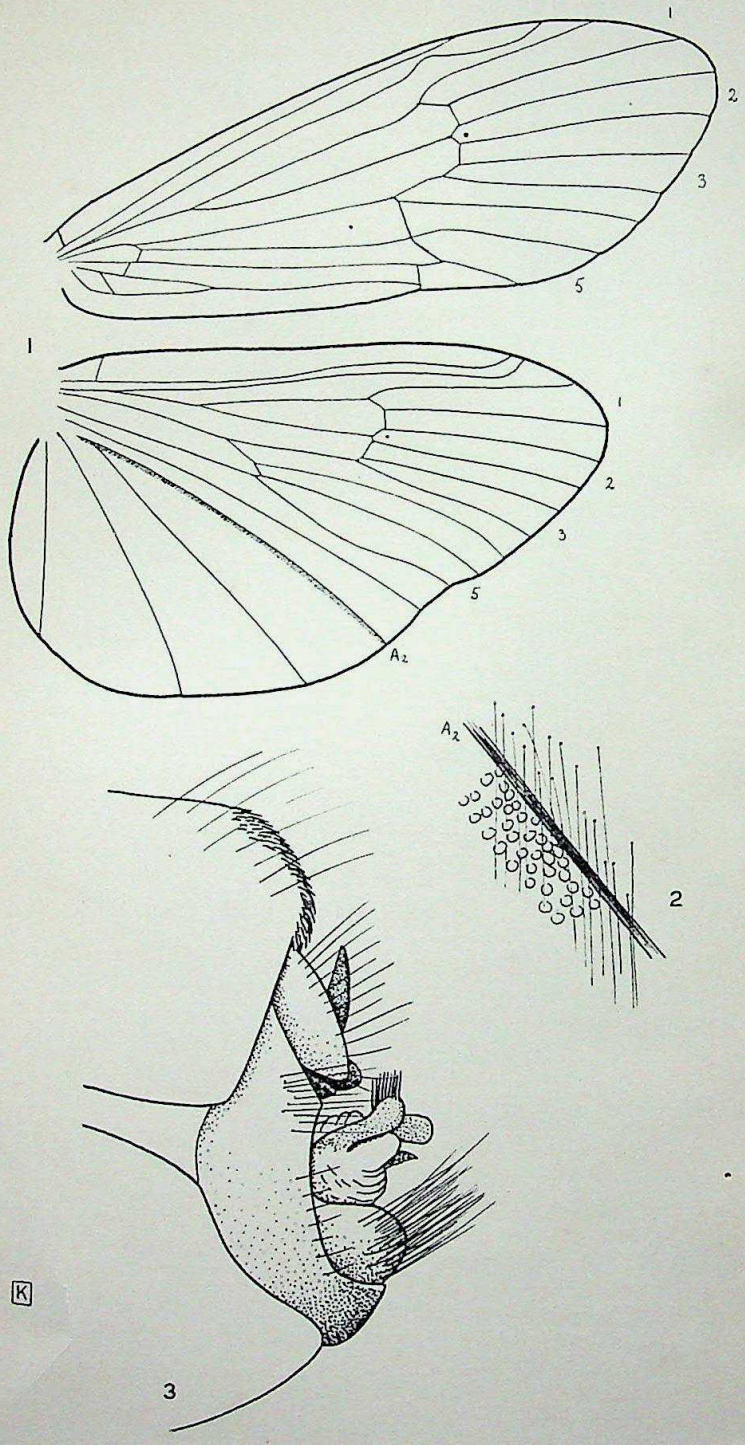
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Pseudostenophylax himalayanus Mart., ♂. Fig. 1, wings. Fig. 2, portion of right posterior wing around A2, enlarged. Fig. 3, genitalia, lateral.

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Type ♂ in the British Museum collection, abdomen mounted in balsam.

Pseudostenophylax himalayanus Martynov (Text-figs. 4-5; Pl. VI, figs. 1-3).

Pseudostenophylax himalayanus Mart. *partim.*—Proc. Zool. Soc. London, Pt. I, No. 6, pp. 92-5 but not figs. 38-41.

Head dark ochraceous; antennae, basal joint yellowish, remainder still paler with no apparent annulations, palpi and legs ochraceous. Wings, anterior, broad, rounded at the apices, membrane yellowish, granulose with short semi-erect yellowish hairs with rather larger blackish hairs in the sub-costal area darkening the base of the wing in this region; costa fringed with very short adpressed black hairs. The wing is irrorated, particularly in the post-costal region with round yellowish spots. Posterior wing yellowish, finely granulose with a dense row of thick whitish scales clothing the second anal vein to the margin of the wing. The basal portion of the wing is not so deep in proportion to its length as in the preceding species, *martynovi*.

Genitalia ♂.—Points of difference between the genitalia of *himalayanus* and *martynovi* few, and are as follows:—

There is no raised upper portion of the setae-clad margin of the eighth dorsal segment; superior appendages from the side with the outer margins convex instead of concave; the terminal portions of the penis-sheaths much broader; inferior appendages from the side, rounded, the apices are not acute as in *martynovi*.

Length of anterior wing ♂ 20 mm.

Tibet: Yatung, 4,500 ft., A. E. Hobson.

Type ♂ with the abdomen mounted in balsam, in the collection of the British Museum.

In the course of the examination of the examples of *P. himalayanus* in the British Museum collection for the purposes of this revision, it was discovered that the two ♂ examples collected by A. E. Hobson in Tibet, remaining in the British Museum, represented two distinct species.

In the light of the discovery, it became apparent that Martynov's description of the wings, more particularly of the posterior wing with its provision of scales 'in a dense row' clothing the vein A_2, referred to the one species but his figures of the genitalia, to the other. This is clearly evidenced by the concave outer margin of the superior appendage as seen from the side.

As the more important characters separating the two species are to be found in neuration, particularly the arrangement of the scales on the posterior wing, I have fixed the type of *himalayanus* as the species bearing the dense row of thick whitish scales. Martynov's figures of the genitalia (figs. 38-41, Proc. Zool. Lond., p. 93, 1930) agree perfectly with mine from the cleared abdomen of *martynovi*.

With regard to the ♀♀, it is impossible to say with certainty, with which species they should be associated and I therefore abstain from including descriptions here.

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Pseudostenophylax griseolus Mart. (Pl. VII, figs. 1-4).

Pseudostenophylax griseolus Mart.—Proc. Zool. Soc. Lond., Pt. I, No. 7, pp. 97-8, 1930.

♀ 'Head reddish-brown above, testaceous in front; ocelli large, whitish; antennae brown, with distinct pale annulations; palpi testaceous. Thorax reddish-brown above, metanotum paler; underside of the thorax reddish-yellow. Legs yellow with black spines; spurs 1, 3, 3 yellow; on anterior tibiae some brownish spots around groups of spines; anterior tarsi also brownish. Anterior wings rather narrow with apical margin rounded; membrane granulose with minute hairs; pale brownish-grey irrorated with numerous small round hyaline spots; costal and sub-costal areas greyish-yellow; dorsal portion behind *Cu* brown, with distinct hyaline spots. *DC* very long, first apical fork impinging only slightly further inward than the second; cross vein *rs-m* equal to *irs* but oblique. Posterior wings sub-hyaline, minutely granulose and hairy; first apical fork impinging not further inward than the second. Abdomen dark brown, ochraceous beneath. Ninth segment rather broad in dorsal part, ventral portion projecting considerably backward and rounded if seen from the side. Sub-genital apparatus composed of a very small median-lobe and two large pale testaceous side-lobes, concave on their inner posterior margins. Superior appendages fused with tenth segment, hairy, triangular as seen from above, united at their bases, apices produced in two slender stick-shaped processes. Side-lobes of tenth segment rounded in profile, broadly divided by a median excision beneath.

Length of body 8 mm. Expanse 27-28 mm.

3 ♀♀ Sikkim: Khamba Jong, 15,000-16,000 ft., 15-30-vii-1903, Tibet Expedition, Lt.-Col. H. J. Walton.

The above is Martynov's description with reproduction of his figures. I am opposed to the description of new species from female types and have not therefore re-described and re-figured the species myself. I am inclined to the opinion that, having regard to the spur formula 1, 3, 3 and the shape of the posterior wing which is not perceptibly excised beneath the apex as in *Pseudostenophylax* species, *griseolus* might be better placed in the genus *Pseudohalesus;* in the absence of the male, I am not prepared to make a definite pronouncement.

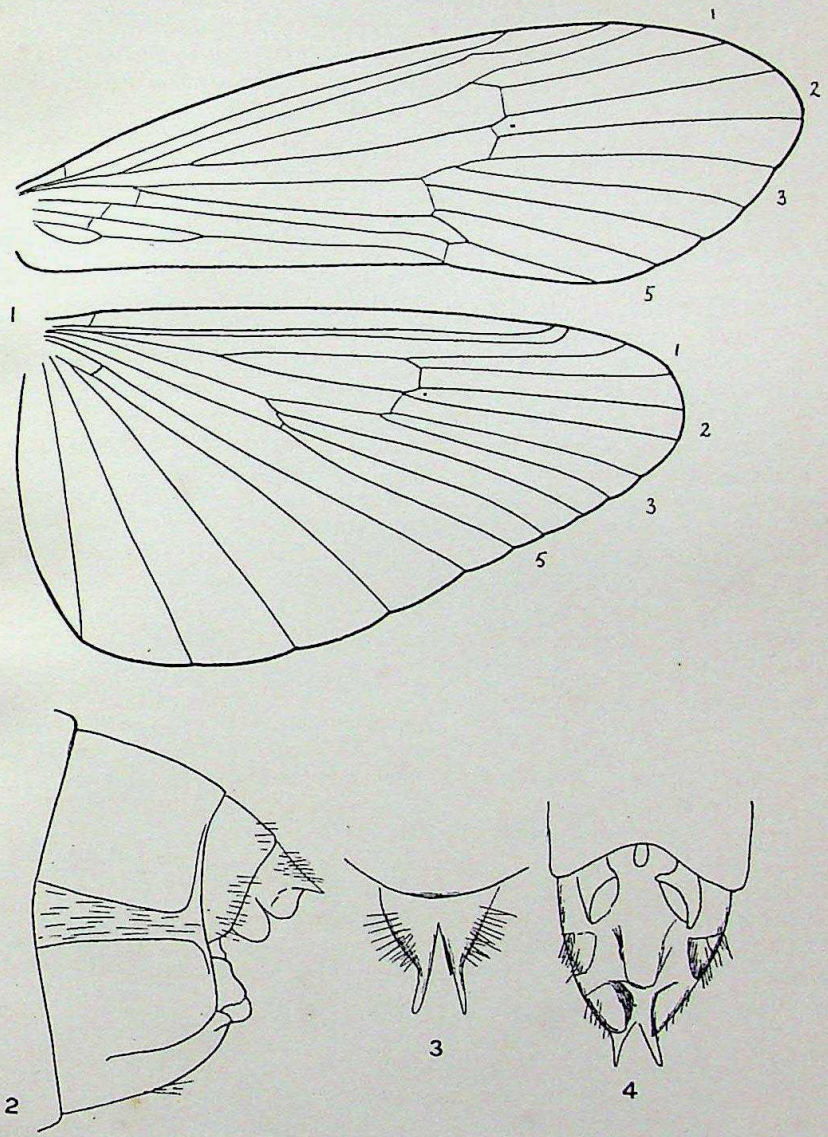
Astenophylodes gen. n.

This genus may be separated from the nearly related *Pseudostenophylax* partly by the presence of spines on the terminal tarsal joint but mainly by the structure of the posterior wing.

Anterior wings rather elongate, apices sub-acute, discoidal cell long and narrow; posterior wing, discoidal cell long and reduced in width to dimensions quite unknown in any other recorded *Limnophilid* genus; the two branches of the sector enclosing this

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Pseudostenophylax griseolus Mart., ♀. Fig. 1, wings. Fig. 2, genitalia, lateral. Fig. 3, dorsal. Fig. 4, ventral (genitalia after Martynov).

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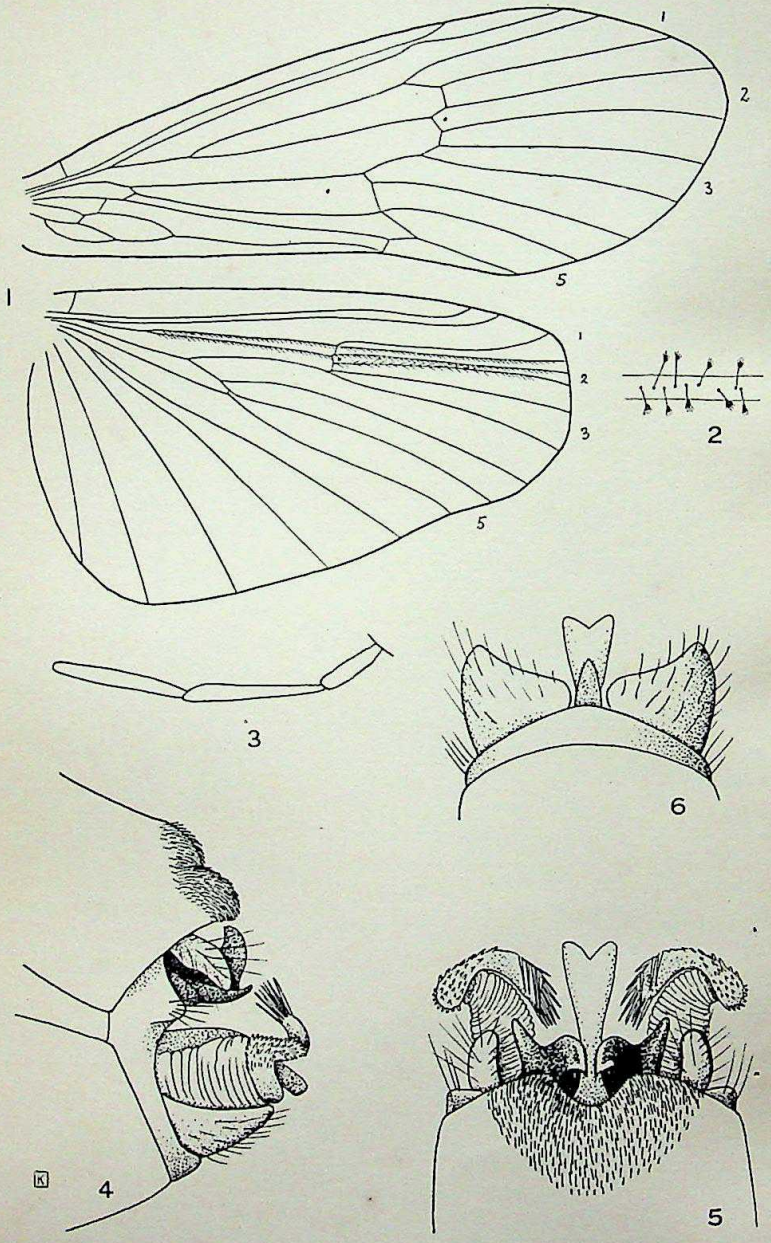
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Astenophylodes burmanus sp.n., ♂. Fig. 1, wings. Fig. 2, specialised hairs of posterior wing, enlarged. Fig. 3, maxillary palpus. Fig. 4, genitalia, lateral. Fig. 5, dorsal. Fig. 6, inferior appendages, penis and lower penis-cover, etc., ventral.

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cell as also the second, third and fourth apical sectors carry rows of peculiarly formed scales each set on a long foot-stalk with a dilated head somewhat of the pattern of the *Lepidopterous battledor* scales. Forks Nos. 1, 2, 3 and 5 in both anterior and posterior wings present. Antennae rather slender, nearly as long as the anterior wing, basal joint large and dilated on its inner margin, adjacent joint very short and the next more than twice as long and longer than each of the remaining joints. Maxillary palpi ♂, basal joint about half the length of the second which is as long as or slightly longer than the third. Spurs 1, 3, 4.

Genotype: *Astenophylodes burmanus* sp. n.

Astenophylodes burmanus sp. n. (Pl. VIII, figs. 1-6).

Head dark fulvous; ocelli greenish-yellow; antennae, basal joint ochraceous, remaining joints fulvous with ochraceous annulations; palpi ochraceous; mesothorax fulvous with large, nearly black lateral markings.

Wings, anterior, dark fulvous with numerous yellowish irrorations, veins dark ochraceous, membrane granulose with innumerable short erect black setae, post-costal area beset with longish recumbent black hairs so that the wing is considerably darkened in this area; narrow darkened borders to the apical veins giving the wings a somewhat striate appearance; posterior wing also granulose, for the rest, as detailed in the generic description. Legs ochraceous with dark patches at the bases of each tarsal joint, spines black.

Genitalia ♂.—Margin of the eighth dorsal segment rounded, set with dense black setae to a considerable depth and with a deep semicircular excision at its centre; superior appendages short and yellowish furnished with rather long hairs particularly along the inner margins; intermediate appendages very strongly chitinised with bifurcate blackened apices, outer forks long and slender, inner wide and rounded as seen from above; from the side the inner fork has an outer convex margin and is directed upward and slightly backward; outer fork slender and directed backward; there is a small rounded lobe at the base of each appendage on its outer side; side-pieces of the ninth segment somewhat produced and triangular, set with long hairs; penis long and straight, apex dilated and widely excised; lower penis-cover strongly chitinised, narrow and tapering to a point; penis-sheaths membranous, from above, the apical extremities curved and lying transversely across the basal stem, outer ends of these transverse portions rounded and set with short teeth, inner ends with long stiff bristles; inferior appendages from beneath, short and broad, apices obliquely truncate, outer angles produced; margin of the ninth ventral segment produced at its centre.

Length of anterior wing ♂ 16 mm.

♀ unknown.

Burma 28°N., 97° 24″E., 11,000 ft., 29-vi-1926, F. Kingdon Ward.

Type ♂ in the British Museum collection, abdomen mounted in balsam.

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Stenophylina Mosely.

Stenophylina Mosely.—Entom., lxix, p. 13, 1936.

Maxillary palpi with the basal joint about half the length of the second which is equal to the third; antennae long and stout, basal joint large and rounded, next joint very short, third longer, about two-thirds the length of the basal joint and longer than the following joints. Anterior wings broad, costal margin rounded, radius bent towards its apex nearly to meet the sub-costa; forks Nos. 1, 2, 3 and 5 present, all sessile; discoidal cell long and narrow; cellula thyridii long and narrow, extending towards the base beyond the cross-vein joining the cubitus and the first anal vein.

Posterior wing with forks Nos. 1, 2, 3 and 5, all sessile; there is a well-developed frenulum situated on the basal half of the costa, consisting of very long fine hairs; anal area produced in a large triangle; discoidal cell long and narrow.

Spurs 1, 3, 4. For genital characters, reference should be made to the description of the single species *mitchelli*.

Genotype: *Stenophylina mitchelli* sp. n.

The genus is evidently related to Martynov's *Pseudostenophylax* having regard to the genitalia, but the posterior wing lacks the specialised hairs or scales which is so characteristic of that genus.

Stenophylina mitchelli Mosely (Pl. IX, figs. 1-6).

Stenophylina mitchelli Mosely.—Entom., lxix, pp. 13-14, 1936.

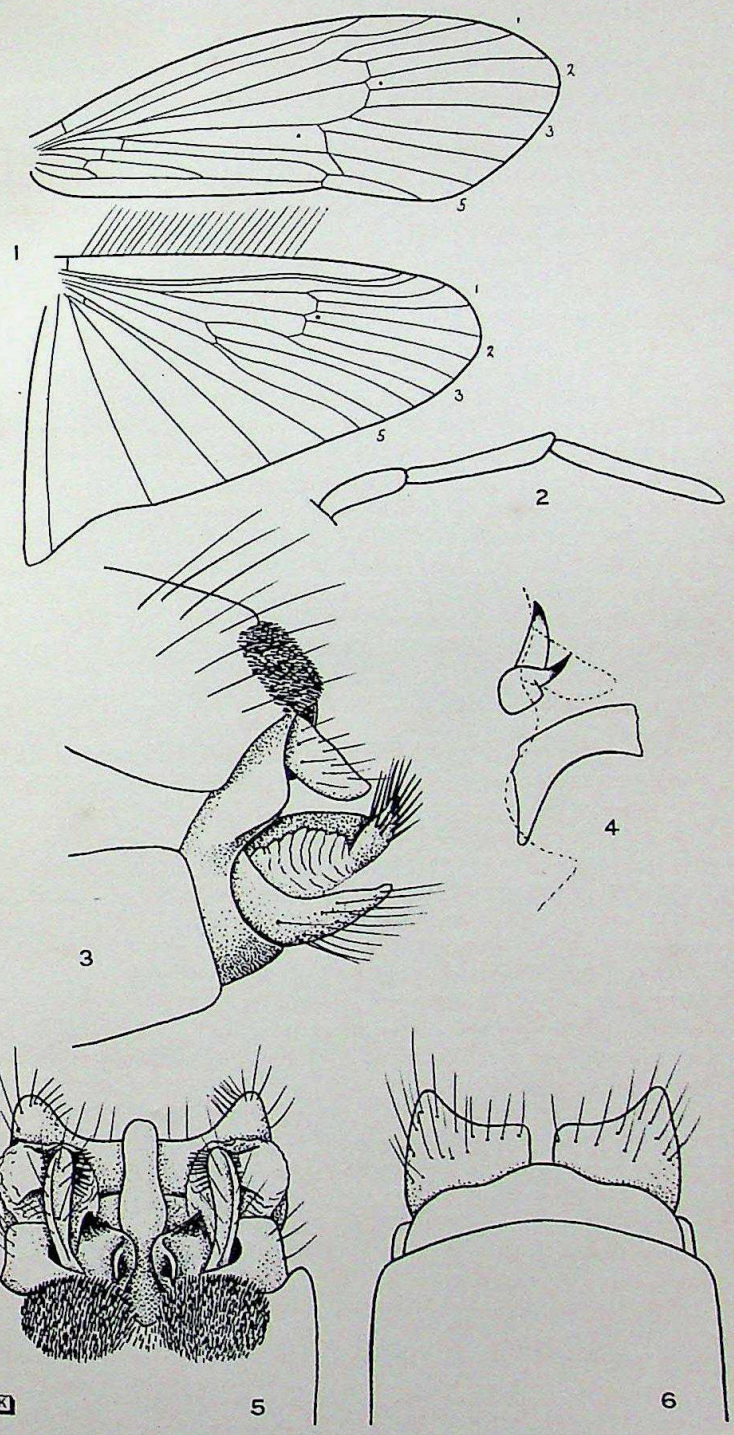
The two examples of this species are both mounted as balsam preparations. The wings are large and brown and the insects bear a general resemblance to species of the genus *Pseudostenophylax* but the costal margin of the anterior wing is far more rounded and the very extraordinary development of the anal region of the posterior wing renders this insect amply distinct from the *Pseudostenophylax* species. The general characters are given in the description of the genus.

Genitalia ♂.—The margin of the terminal dorsal segment is produced at its centre in two large rounded lobes closely set with minute black setae and with a deep excision between; superior appendages small and narrow; intermediate appendages from above broad and triangular, inner angles produced in strong black teeth directed upwards, apical angles also blackened; from the side, the apical angle appears as a short, slightly curved spur and the inner angle as a well-developed and much larger black upwardly-directed tooth. Penis from above, long, dilated slightly at the centre, apex rounded; from the side it curves slightly downward with a truncate apex. Penis-sheaths long and membranous, apices furnished with long bristles or teeth. Inferior appendages very broad, nearly quadrangular, apices truncate with the outer apical angles slightly produced; from the side the appendage is rather narrow with a concave upper margin and acute apex; the margin of the terminal ventral segment produced slightly at its centre.

Length of anterior wing ♂ 16 mm.

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Stenophylina mitchelli sp.n., ♂. Fig. 1, wings. Fig. 2, maxillary palpus. Fig. 3, genitalia, lateral. Fig. 4, intermediate appendages and penis, lateral. Fig. 5, genitalia, dorsal. Fig. 6, inferior appendages, etc., ventral.

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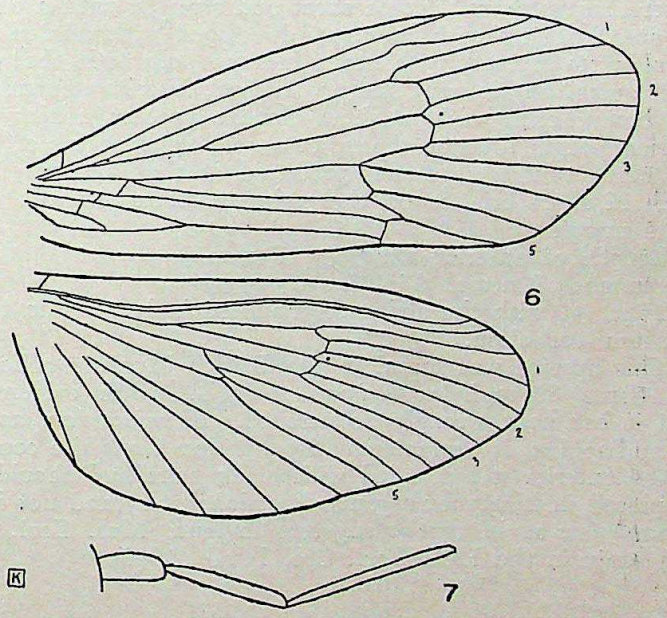
Kashmir: Lake Vishensar 12,000 ft., F. J. Mitchell.

Type ♂ and paratype ♂ in the author's collection, both mounted as balsam preparations, one pair of wings of the type mounted dry.

I dedicate this species to the memory of the late F. J. Mitchell to whom is due the introduction of trout into Indian waters and who took a keen interest in the entomology of Kashmir in its relationship to trout food.

Trichophylax gen. n. (Text-figs. 6-7).

Antennae broken away at the second basal joints in the unique example; basal joint long, second joint very short; maxillary palpi ♂, basal joint short, stout, about half the length of the second,



Figs. 6–7. *Trichophylax rotundipennis* sp.n., Fig. 6, wings ♂. Fig. 7, maxillary palpus ♂.

third nearly half as long again as the second. Anterior wing, membrane granulose with erect black hairs particularly along the veins, apex broad and rounded, costa rounded; posterior wing only slightly broader than the anterior, also granulose with very small erect hairs; discoidal cell long in both wings. Spurs 1, 3, 4 (?), rather difficult to make out in the single example. Dorsal segments of the abdomen bearing long fine silky hairs. Genitalia conforming to the general pattern of the *Pseudostenophylax* group.

Genotype: *Trichophylax rotundipennis* sp. n.

This is the first Trichopteron I have seen with an abdomen provided with long fine hairs along the dorsal segments.

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Trichophylax rotundipennis sp. n. (Pl. X, figs. 1-3).

Head dark fulvous, paler next to the oculi; antennae, palpi and legs fulvous. Other characters are given with the generic description.

Genitalia ♂.—The margin of the eighth dorsal segment bears at its centre a mat of unusually coarse black setae, the centre itself is produced and elevated so that the setae appear more dense in this region; superior appendages from above, short and slender, curving inwards and fringed with long hairs; from the side, broad at the base and tapering to a rounded apex; intermediate appendages from above appear as ear-shaped processes with blackened rims curving upwards at their inner and still more blackened margins; from the side the appendage appears as an upwardly directed rather stout process. Penis short and straight with a collar below the apex; penis-sheaths strongly developed with dilated triangular apical parts fringed with stout bristles and with the upper and lower apical angles bent sharply inward; inferior appendages short and broad, each with a short slender process arising from the interior margin towards the inner angle; the margins of the eighth and ninth ventral segments produced at their centres; there is a patch of short bristles on the eighth sternite towards the centre of its margin.

Length of anterior wing ♂ 16 mm.

Punjab: Murree, 6-ix-86. 46-83.

Type ♂, with the abdomen mounted in balsam, in the British Museum collection.

This species was found in the British Museum collection over the name *Stenophylax micraulax* McL. It is evident however that it has been wrongly determined. *S. micraulax*, as described by McLachlan, is characterised by a groove along the costal margin of the anterior wings, filled with black hairs and should therefore be placed in Martynov's genus *Pseudohalesus* (and not in *Pseudostenophylax* as Martynov suggests in Ann. Mus. Zool. Ac., 1927 and again in the Proc. Zool. Soc. Lond., 1930).

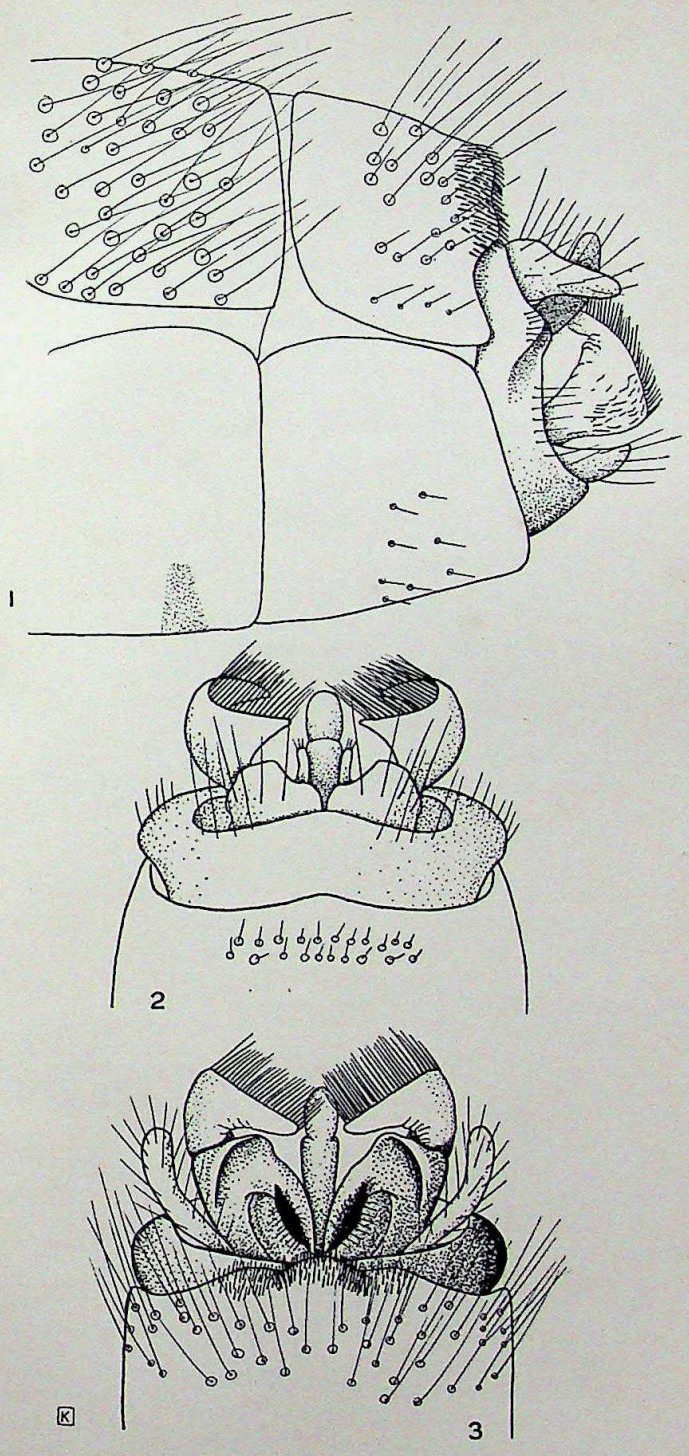
Pseudohalesus Martynov.

Pseudohalesus Martynov.—Ann. Mus. Zool. Acad. Sci. U.S.S.R., vol. xxviii, pp. 480-1, 1927.

Antennae rather short, basal joint bulbose, next joint very short, the next about three times longer and about twice as long as the following joints. Maxillary palpi of the ♂ with the basal joint very short, second and third long and equal; ♀, basal joint half the length of the second, third slightly longer than the second, fourth as long as the second, fifth slightly longer than the fourth. Anterior wings brownish, usually obliquely truncate at their apices, membrane granulose with numerous semi-erect, very short black hairs, rather longer along the veins; along the costal margin towards the base is a narrow fold filled with short black specialised hairs; the posterior wings are without the specialised hairs or

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Trichophylax rotundipennis sp.n., ♂. Fig. 1, terminal abdominal segments and genitalia, lateral. Fig. 2, ventral. Fig. 3, dorsal.

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scales found in *Pseudostenophylax*, membrane rather more granulose than usual and, as in the anterior, carrying numerous semi-erect hairs but smaller and less dense than in that wing; discoidal cell in both wings long. Legs, first joint of the anterior tarsus long, carrying a mat of short black setae along its under surface, spines black, few in number and absent on the terminal tarsal joint; spurs 1, 3, 3.

Genotype: *Pseudohalesus asiaticus* Ulmer.

Pseudohalesus kaschmirus Mart. (Text-fig. 8).

Pseudohalesus kaschmirus Mart.—Ann. Mus. Zool. Acad. Sci. U.R.S.S., xxviii, Pt. I, pp. 481-2, Pl. XXV, figs. 1-3, 1927.

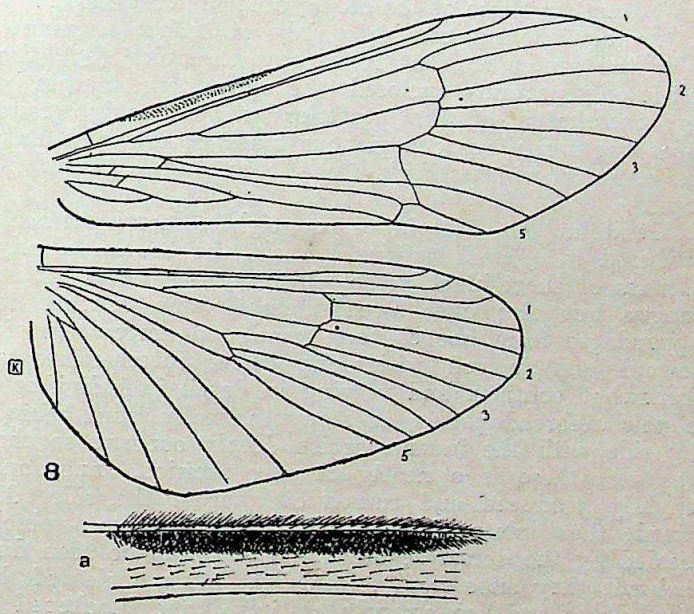


Fig. 8. *Pseudohalesus kaschmirus* Mart., wings ♂. 8A. costal area of anterior wing more enlarged.

This species is to be distinguished from *P. aberrans* only by its neuration and size. I have been able to find no satisfactory distinctions in the genitalia by which to separate the two species.

On a comparison of the figures of the wings of the two insects, it will be noticed that in both anterior and posterior, fork No. 1 is of normal width in *kaschmirus* and exceptionally narrow in *aberrans;* in the former species, fork No. 3 is present in both wings, in the latter, generally absent, in occasional examples present perhaps only in one wing and then unusually narrow.

Length of anterior wing ♂ 15 mm.

Western Tibet: Chagra, 15,215 ft., 4-vii-1932, G. E. Hutchinson, Yale North India Expedition; Kashmir, 7-8-vi-1910.

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Pseudohalesus aberrans sp. n. (Pl. XI, figs. 1-10).

Head dark fulvous; ocelli white and rather prominent; antennae fulvous with paler annulations; palpi and legs pale fulvous. Anterior wings warm fulvous with yellowish irrorations more numerous in the post-costal region, membrane granulose, set with black erect hairs very long on the veins and closer together and more recumbent in the post-costal region so that the wing is considerably darkened in this area; in the ♂ there is a groove along the costa towards the base filled with specialised black hairs as indicated in the generic description; in this sex also the anterior wings in each example of a series of four, show varying aberrations in neuration but all agree in the absence of fork No. 3 which is absent also in the wings of one of the females represented but present in those of the other; other aberrations are too variable for description and consist mainly of broken nervures, in particular the sector so that in several examples (♂), the discoidal cell is only partially enclosed, the upper basal margin being wanting; membrane of the posterior wings weakly granulose with short but much less conspicuous black or brownish hairs than on the anterior wings. Fork No. 3 sometimes present, sometimes absent.

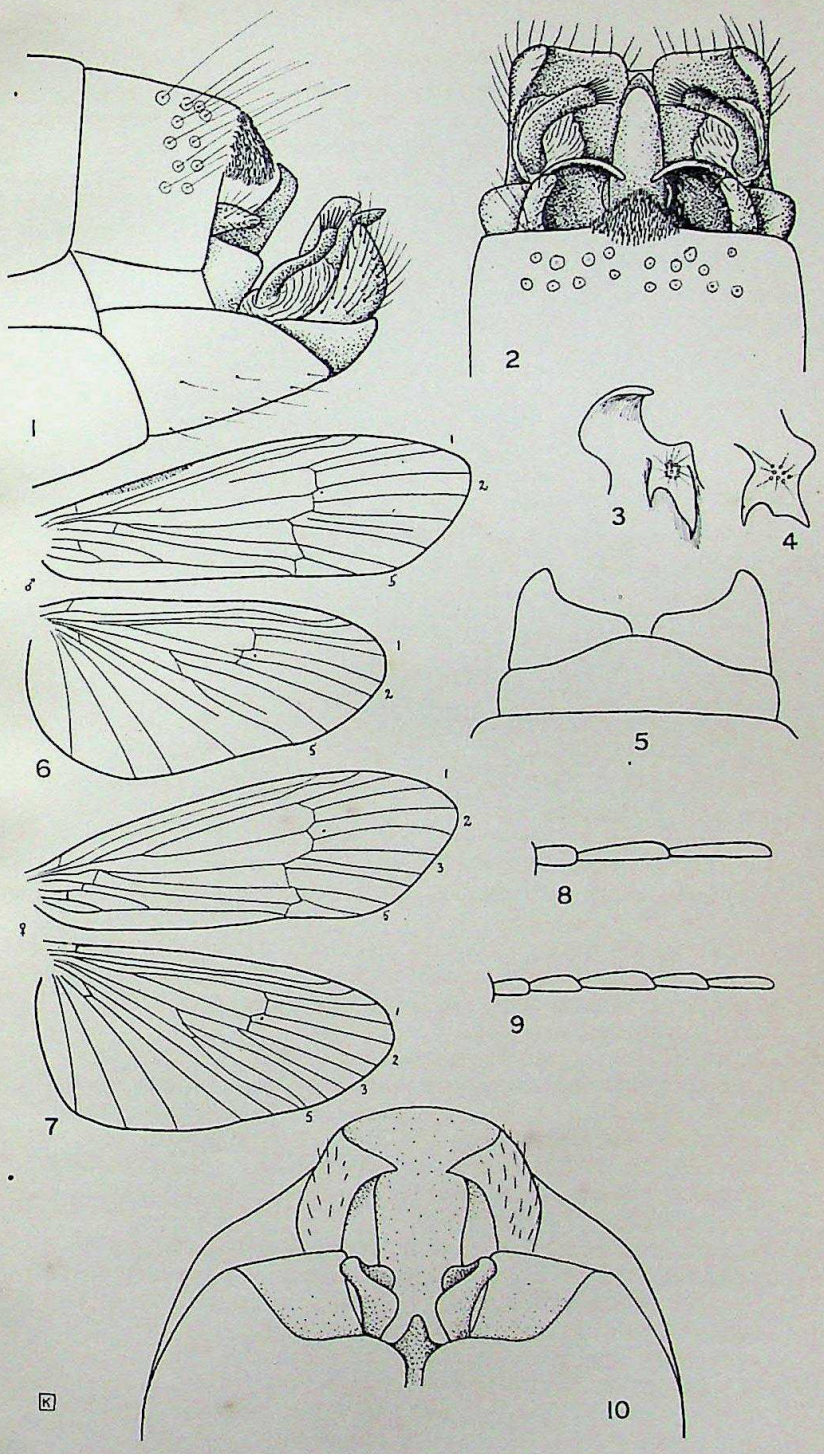
Genitalia ♂.—Margin of the eighth dorsal segment which is produced in a black tongue towards the centre, closely set with a mass of short black setae which form a mat, not only on the tongue but also over a considerable area beneath it; superior appendages from above, very small and narrow, curving slightly inward and fringed with long hairs; intermediate appendages somewhat complex and varying in detail in individuals; there is a pair of broad plates, as seen practically from behind, set side by side with the inner margins deeply concave so that between the two there is a nearly circular excision, inner apical angles slightly produced and turned over, from the side, directed upward; these plates form the bases for processes which are concealed by the dorsal segment and can only be seen directly from behind; they arise from towards the inner angles of the bases of the plates and are strongly chitinised and blackened; they vary in shape in individuals as indicated in the figures but agree in having small warts covered with long hairs at their bases; penis short and straight, sheaths membranous, no doubt extensile to judge by the creases in the membranes, apices set with long bristles; inferior appendages very broad, apices sinuous, nearly truncate, outer angles slightly produced.

Genitalia ♀.—The structure is only visible from directly behind; the ninth segment is produced at the centre of its lateral margins in two acute triangles directed inwards; below this is the vulvar scale with a pair of leaf-like, rather broad and sinuous lateral processes with a very small central lobe between. In both sexes the margin of each ventral segment carries a pair of nearly parallel rows of bristles separated from each other slightly towards their centres to enclose a narrow clear space (excepting the eighth where the bristles are closer together).

Length of anterior wing ♂ 10-12 mm.

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Pseudohalesus aberrans sp.n., Fig. 1, genitalia ♂, lateral. Fig. 2, dorsal. Fig. 3, intermediate appendage, dorsal. Fig. 4, basal plate of the appendage from another specimen. Fig. 5, inferior appendages, etc., from beneath. Fig. 6, wings ♂. Fig. 7, wings ♀. Fig. 8, maxillary palpus ♂. Fig. 9, ♀. Fig. 10, genitalia ♀, ventral.

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Length of anterior wing ♀ 11 mm.

Western Tibet; Kyam, about 15,500 ft., 19-25-vii-1932, C. E. Hutchinson, Yale North India Expedition.

Type ♂ in the British Museum collection, mounted in balsam, one pair of wings dry. Paratypes ♂♂, ♀♀ from the same locality in the British Museum and Yale University collections.

All the species of the series were found dead under stones. This is a strange insect and I can find no satisfactory variation in genitalia on which alone to separate the species from *P. kaschmirus* Martynov. Had I been confronted with a single example, I should unhesitatingly have considered it as merely an aberrant dwarfed form of this species. But having regard to the fact that Mr. Hutchinson obtained a series of no less than six examples, it is impossible to believe that in nearly all, a mere aberration could take the same form, i.e., the absence of fork No. 3 in both wings.

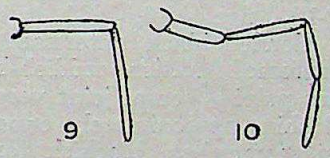
Halesinus Ulmer (Text-figs. 9-10).

Halesinus Ulmer.—Notes Leyden Mus., xxix, No. 1, pp. 3-4, fig. 3, 1907; Gen. Insect., fasc. 60a, pp. 57-8, Pl. V, fig. 38, 1907.

The genus *Halesinus* was erected by Ulmer to take a single ♀ species *tenuicornis* and the generic characters have been selected in accordance with the characters of this ♀. Subsequently Martynov described another ♀, *ussuriensis*.

The first ♂ to be recorded was found in the collection of the British Museum, from Tibet, and described by Martynov, in 1930, in the Proc. Zool. Soc. Lond., under the name *albipunctatus*.

Martynov described both sexes but does not figure the ♂ wings nor extend the generic description to cover this sex.



Figs. 9–10. *Halesinus albipunctatus* Mart., Fig. 9, maxillary palpus ♂. Fig. 10, maxillary palpus ♀.

When, for the purposes of this revision I found it necessary to prepare figures of the ♂ wings, it became apparent that the neuration of the ♂ is abnormal, and that the genus must be considered as exceptional as is the case with *Thamastes*, *Anomalopteryx* and *Enoicyla*.

The characters given below are based on those selected by Ulmer and refer to the ♀ sex alone, with the exception of the spurs which are 1, 3, 3 in both sexes.

Head very short and broad with a pair of transverse warts towards the back and a pair of small rounded warts between these and the lateral ocelli; antennae generally thin, as long as

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the anterior wing, the basal joint thicker and longer than the following ones and longer than the head; maxillary palpi very long and fine, first joint short, second equal to the fourth, the third somewhat longer, as long or even longer than the fifth; legs thin and long, with the spurs 1, 3, 3 inner spur slightly longer than the outer, spines black; first joint of the fore-tarsus as long as the second and third joints together. Anterior wing thickly clothed with hair and with the apex dilated, the apical border undulating so that the margin is concave in the fourth, fifth and sixth apical cells, the fringe at these points being comparatively long; neuration of the ♀ regular, forks Nos. 1, 2, 3 and 5 present; radius bent slightly before its extremity; discoidal cell very long and narrow, about three times as long as its foot-stalk, its upper and lower margins nearly straight; fourth apical cell closed by a straight nervure which is slightly longer than that of the second. Posterior wing only slightly broader than the forewing, discoidal cell much shorter than that of the forewing; only 8 apical veins present instead of the usual nine, the sixth apical vein being missing so that only forks Nos. 1, 2 and 5 are present; fourth apical cell as in the anterior wings.

It may be added, with reference to the male, that in the posterior wing the discoidal cell is wanting, only fork No. 5 is present and that the first joint of the maxillary palpus is very minute. It cannot be made out at all in the type of *albipunctatus* in the British Museum, but Mr. Martynov (*in litt*) states that 'in the ♂ of *H. ussuriensis* there are three joints of which the basal is very short although distinct'.

Halesinus albipunctatus Mart. (Text-figs. 9-10; Pl. XII, figs. 1-8).

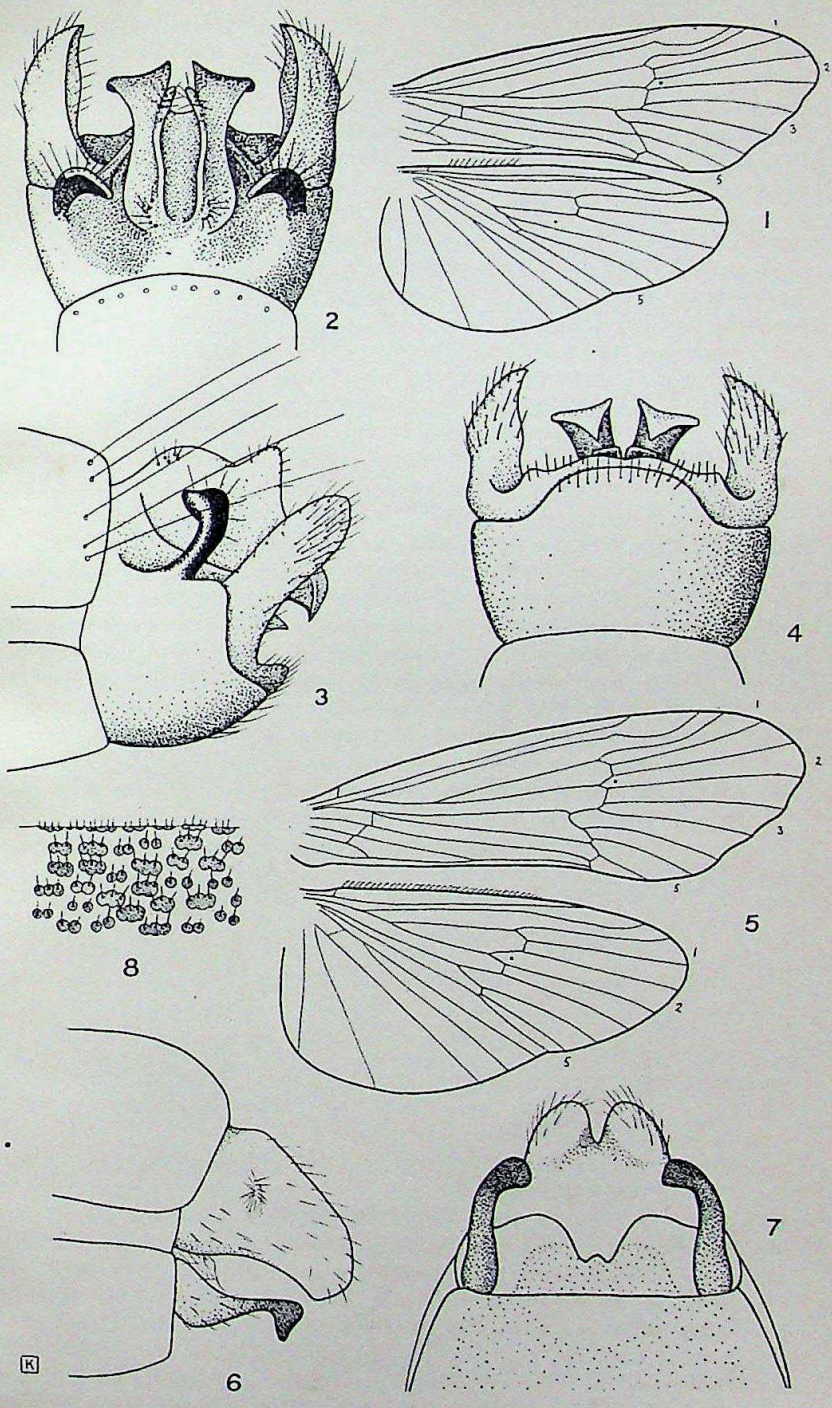
Halesinus albipunctatus Martynov.—Proc. Zool. Soc. Lond., Pt. I, No. 7, pp. 98-100, figs. 52-6, 1930.

Head black with slender black antennae; mesonotum black with the median impressed portion reddish-brown; metanotum dark brown. Maxillary palpi ♂ basal joint very short, second and third joints long and thin, approximately equal in length. Legs yellowish-brown; tarsi somewhat blackish externally. Anterior wing dilated towards the apex the margin of which is obliquely truncate, and distinctly undulating so that it is concave in the fourth, fifth and sixth apical cellules; membrane brown, clothed with blackish hairs; there are several pale yellow rounded spots particularly in the costal and sub-costal areas and two oblique pale spots between the cubitus and the hind margin and also two round yellowish spots at the arculus; fringe long with whitish spots here and there; discoidal cell long; posterior wing ♀ smoky, with a long discoidal cell; neuration of the male posterior wings abnormal as may be seen in the figure; there is a well-developed frenulum in both sexes, an unusual feature in the *Limnophilidae*.

Genitalia ♂.—Margin of the eighth dorsal segment fringed with long stout hairs; from above, beyond it is a large bifurcate dorsal plate with a narrowish cleft between the two forks, the sides of the cleft standing up in two sharp ridges of which the

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Halesinus albipunctatus Mart., Fig. 1, wings ♂. Fig. 2, genitalia ♂, dorsal. Fig. 3, lateral. Fig. 4, ventral. Fig. 5, wings ♀. Fig. 6, genitalia ♀, lateral. Fig. 7, ventral. Fig. 8, portion of penultimate ventral segment ♀, enlarged.

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distal ends are abruptly elevated in a pair of triangular processes; beyond the cleft, the plate slopes sharply downward and each fork terminates in a broadened truncate apex, apical angles projecting beyond the sides of the fork; on each side of the dorsal plate there is a large, strongly chitinised blackened curved hook, as seen from the side, directed upward with the apex slightly forward; penis retracted and difficult to make out; lower penis-cover broad, with excised apex which, seen from beneath appears as a pair of broad, shallow, truncated lobes; inferior appendages single-jointed; from the side, rather broad and straight, directed upward; from above, outer margins convex, inner straight or slightly sinuous, apices acute; from beneath, they are widely separated but connected at their bases by a strongly chitinised plate with a sinuous apical margin; margin of the ninth ventral segment strongly produced and rounded at its centre.

Genitalia ♀.—From above, the ninth dorsal segment terminates in two triangular processes separated from each other by a narrow cleft, each with a rounded wart at its base; from the side, they are very broad at the base, upper margins convex, lower sinuous, apices directed downwards; the margins of these processes and also the warts are rather densely fringed with long hairs; on each side of the central triangular processes are rather short, strongly chitinised caliper-like branches which, from beneath, terminate in clavate apices; from the side, each of these branches has the appearance of a duck's head, neck and shoulders directed downward; there is a ventral plate with a deeply cleft apical margin and a small central lobe, no doubt representing the vulvar scale; along the margin of the penultimate ventral segment there is a deep band of minute black setae arranged in groups of twos and threes to make a close pattern.

Length of anterior wing ♂ 11 mm.
Length of anterior wing ♀ 12 mm.
Tibet; Yatung, A. E. Hobson.
Type ♂ and 3 paratypes ♀♀ in the British Museum.

Platyphylax McLach.

Platyphylax McLach.—Journ. Linn. Soc. Zool., xi, p. 109, 1871; Rev. and Syn. Trich., p. 143, 1875; Ulmer.—Gen. Insect., fasc. 60a, pp. 53-4, 1907.

Spurs 1, 2, 2, ♂♀. First joint of the anterior tarsi long in both sexes. Palpi and legs slender (typically). Form of wings and general appearance much as in *Stenophylax* or *Halesus* (typically); anterior wings shining with scarcely any pubescence on the membrane (typically). Male with long up-directed inferior and broadly rounded superior appendages. The apex of the abdomen very obtuse, without appendages.

The above is McLachlan's description of the generic characters but he adds 'The Chinese *P. lanuginosus* and numerous North American species are widely divergent and in a general work on the species of the world it would be necessary to place them in several genera'.

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Martynov's *rufescens*, a ♀, and the only described Indian species, hardly conforms to the generic characters, but until the Indian species of this genus are better known, particularly the males, it would be premature to extend the characters to cover this one case.

Genotype: *Platyphylax frauenfeldi* Brauer.

Platyphylax rufescens Martynov (Pl. XIII, figs. 1-5).

Platyphylax rufescens Martynov.—Proc. Zool. Soc. Lond., Pt. I, No. 7, pp. 105-6, figs. 64-6, 1930.

The type of this species is a ♀ of which Martynov's description is as follows:—

'Head and thorax yellowish-rufous with concolorous hairs. Antennae and palpi also yellowish-rufous. Legs yellow with few black spines; spurs yellowish-rufous 1, 2, 2. Anterior wings with parabolic apical margin, membrane finely granulose clothed with short yellowish hairs; fringe concolorous, yellowish without markings; post-costal area slightly brownish, irrorated with indistinct hyaline spots. Discoidal cell long, somewhat dilated at the end; first and third forks triangular, not deeply impinging inwards. Nervures pale testaceous. Posterior wings yellowish, sub-hyaline. Neuration resembling that in the anterior wings; fourth apical cell closed basally by an oblique nervure as in the anterior wings. Discoidal cell very long. Abdomen pale reddish-yellow, seventh, eighth and ninth segments brownish. Eighth segment normal, large; eighth sternite with a deep excision, side borders of which are sinuous; behind the sternite is small oval lobe and in the distal portion of the excision two minute lobules. Ninth segment small, reduced, more or less fused above with the tenth segment and with the superior appendages, but lateral portions better developed, subquadrate beneath, hairy; dorsal portion of the ninth segment with a median excision as far as the base. *Appendices superiores* fused with the tenth segment but their edges discernible above; from above they are broad at the base with oblique outer margins; hind margins excised and each sub-divided into two small lobes. Tenth segment (fused with the superior appendages) forming two long stick-shaped processes above and a transverse short plate beneath.

Length of body 10 mm. Expanse 27 mm.

Tibet; Yatung, 4,500 ft., A. E. Hobson.

Type ♀ and paratype ♀ in the British Museum.'

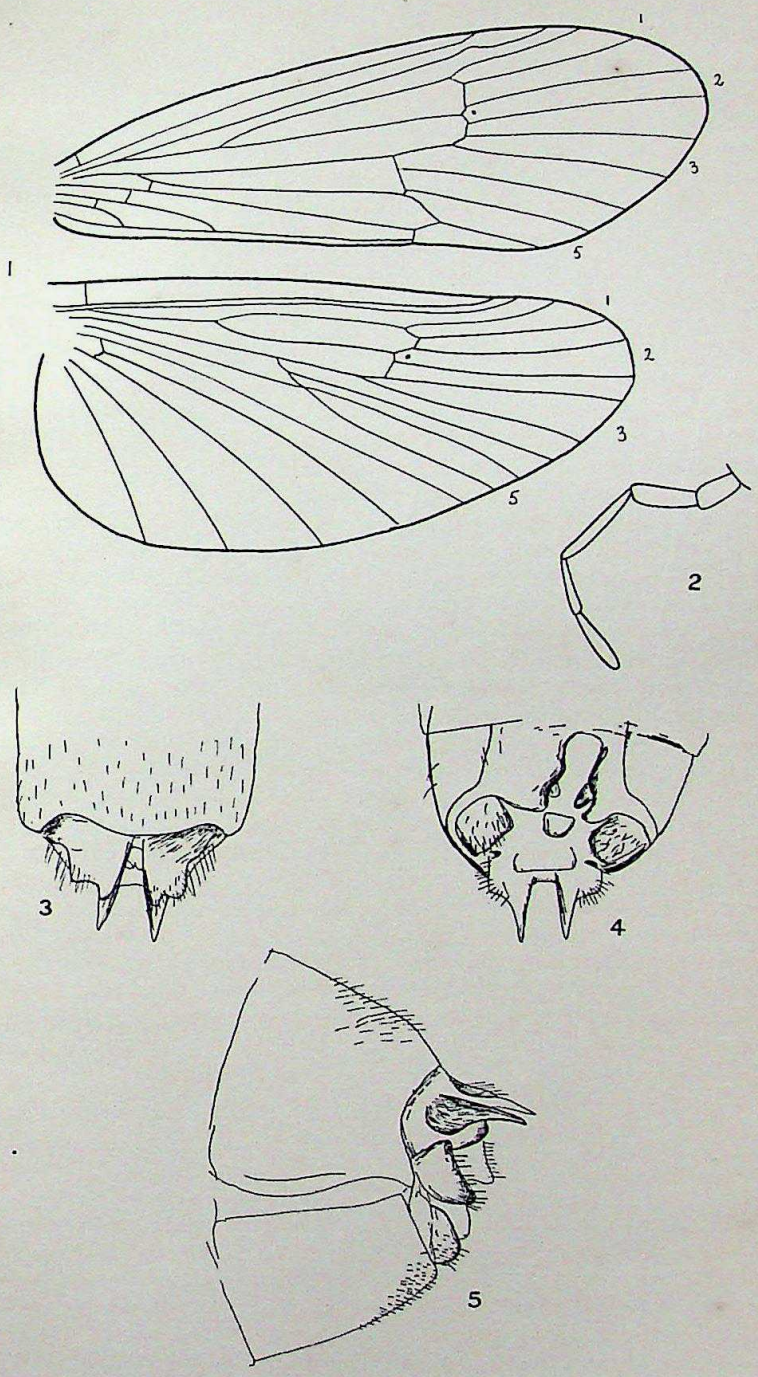
Phylostenax Mosely.

Phylostenax Mosely.—Entom., lxviii, p. 184, 1935.

Insects large and brown, somewhat resembling *Pseudostenophylax* species but without the specialised scales of the posterior wing; anterior wing somewhat elongate, costal margin straight, apex only slightly dilated; in both wings second apical cellules very broad and forks No. 3 very acute at their bases; anterior wing, discoidal cell rather long and narrow, that of the posterior wing very broad at its distal end; shape somewhat different in

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Platyphylax rufescens Mart., ♀. Fig. 1, wings. Fig. 2, maxillary palpus. Fig. 3, genitalia, dorsal. Fig. 4, ventral. Fig. 5, lateral (genitalia after Martynov).

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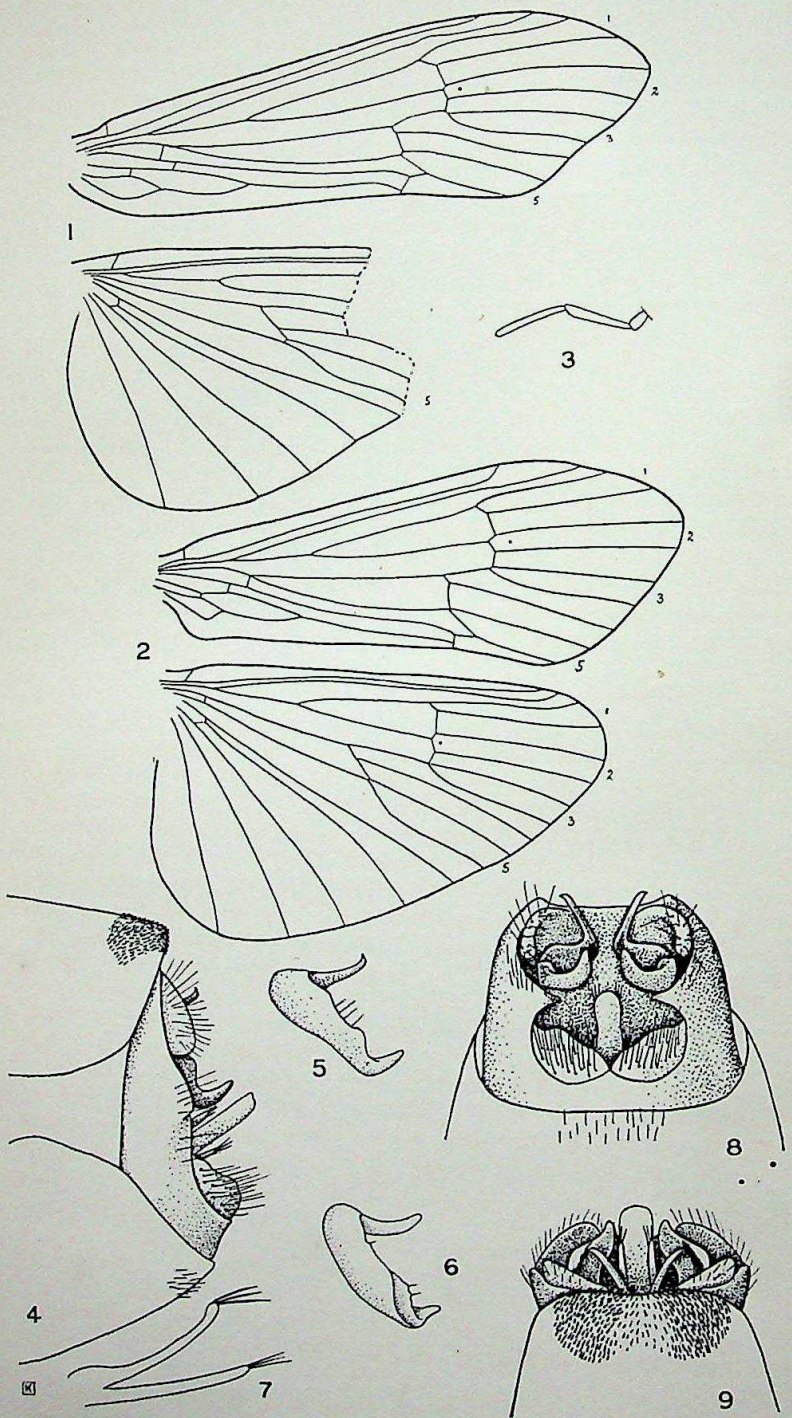
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Phylostenax himalus sp.n., ♂. Fig. 1, wings of type (Muktesar). Fig. 2, wings of a second specimen (Darjiling). Fig. 3, maxillary palpus. Fig. 4, genitalia, lateral. Fig. 5, intermediate appendage (Muktesar). Fig. 6, ditto (Darjiling). Fig. 7, a penis sheath, lateral (Darjiling). Fig. 8, genitalia, from beneath and behind. Fig. 9, genitalia, dorsal.

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the example from Muktesar, but the wings in this insect are incomplete; membrane of the anterior wings scarcely granulose, brownish with numerous pale round irrorations; pubescence somewhat scanty but there is a mat of black hairs in each basal anal angle of the anterior wings.

Maxillary palpus male, first joint small, second and third long and approximately equal in length. Legs, terminal tarsal joints scantily furnished with black spines; genitalia, given in detail in the description of the genotype.

In the Muktesar insect the spurs are 1, 2, 2, but in the examples from Darjiling the legs are so broken that the spurs are uncertain. Three legs are gummed to the label, one showing three spurs, but these may perhaps have been detached from some other insect.

Genotype: *P. himalus* Mosely.

If the spurs alone were considered, *himalus* might perhaps be placed in *Platyphylax*, but McLachlan considered that the European species *P. frauenfeldi* was typical of the genus and that the ultra-European species would be better placed in other genera.

As I am also of opinion that the collection of many widely divergent forms of neuration and genitalia in one genus tends to confuse rather than simplify classification, I prefer to create a new genus rather than overload an existing one.

Phylostenax himalus Mosely (Pl. XIV, figs. 1-9).

Phylostenax himalus Mosely.—Entom., lxviii, p. 184, 1935.

General characters detailed in the generic description.

Genitalia ♂.—Margin of the eighth dorsal segment covered with small black setae which tend to group in two rounded masses towards the sides of the segment; superior appendages small and very wide, scarcely showing beyond the margin of the segment, from the side pear-shaped; the intermediate appendages are branched and the upper branches project beyond the margin of the segment, appearing as two divergent, rod-like processes; the lower branches are heavily chitinised and from above are rather widely separated, broad, inclining towards each other, apices wide and truncate, turned slightly upward with a strong ridge connecting the two apical angles; from beneath and slightly behind, they are strongly curved and direct upward; penis short and straight, furnished with a pair of forked sheaths whose apices are fringed with stiff bristles, the upper branch of each fork appearing above the penis and the lower, below; inferior appendages very small and wide, welded to the segment, on the eighth sternite, towards the centre is a tuft of fine spines.

Length of anterior wing ♂ 15 mm.

United Provinces; Kumaon, Muktesar, 7,000 ft., 24-iv-1923 to 15-v-1923, Fletcher coll.; Darjiling.

Type ♂ (Muktesar) in the collection of the British Museum. Paratypes, 2 ♂♂ Darjiling, in the collection of the Indian Museum, Calcutta.

The example from Muktesar differs slightly from the two examples from Darjiling both in the form of various parts of the

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genitalia and also in the neuration, particularly in the form of the base of the discoidal cell in the posterior wing, wings much broken in the Muktesar insect. These differences, however, do not in my opinion, warrant the separation of a second species. The spurs of the legs of the Darjiling examples are doubtful as the legs have been broken off and reattached, possibly mistakenly.

Anabolia Stephens.

Anabolia Stephens.—Ill. Brit. Ins., p. 229, *partim* 1837; McLach.—Rev. and Syn. Trich., p. 101, 1875; Ulmer.—Gen. Insect., fasc. 60a, p. 45, 1907.

Spurs 1, 3, 4, ♂ ♀. Anterior tarsi with the first joint long in both sexes. Antennae about the length of the wings, moderately stout. Anterior wings elongate, nearly unicolorous, fuscous, gradually, but not widely, dilated to the apex which is parabolic; discoidal cell and most of the apical cellules long; external basal cellule and ninth apical cellule short, the latter not extending to the anal angle; membrane scarcely granulose; no pterostigma. In the posterior wings, the fourth apical cellule at its base is as broad as the second, and is closed by an oblique nervule. Superior appendages of the ♂ very large; intermediate forming two long laterally-lanceolate blades; inferior short and cylindrical. Penis-sheaths furcate at the apex; penis slender, simple. No ventral teeth in either sex. In the ♀, the abdomen is very obtuse; ninth dorsal segment small; no appendages, but the tubular piece above forms broad sub-quadrate lobes.

I have given above McLachlan's description of the genus. The single Indian known species, *oculata*, has been described by Martynov and placed in *Anabolia*. I am unacquainted with the species and cannot say to what extent the neuration conforms with the above characters as the wings are not figured.

Anabolia oculata Martynov. (Text-figs. 11-13).

Anabolia oculata Mart.—Ann. Mus. Zool. Acad. Sci. St. Petersb., xiv, pp. 259-60, Pl. V, figs. 1-3, 1909.

Head, thorax and abdomen blackish fuscous; antennae black; maxillary palpi fuscous; coxae and femora black, anterior and median tibiae fuscous, tarsal joints testaceous, at the apex brownish; tibiae of the posterior pair proximally testaceous, distally fuscous; spines black. Anterior wings fuscous with some hyaline markings:

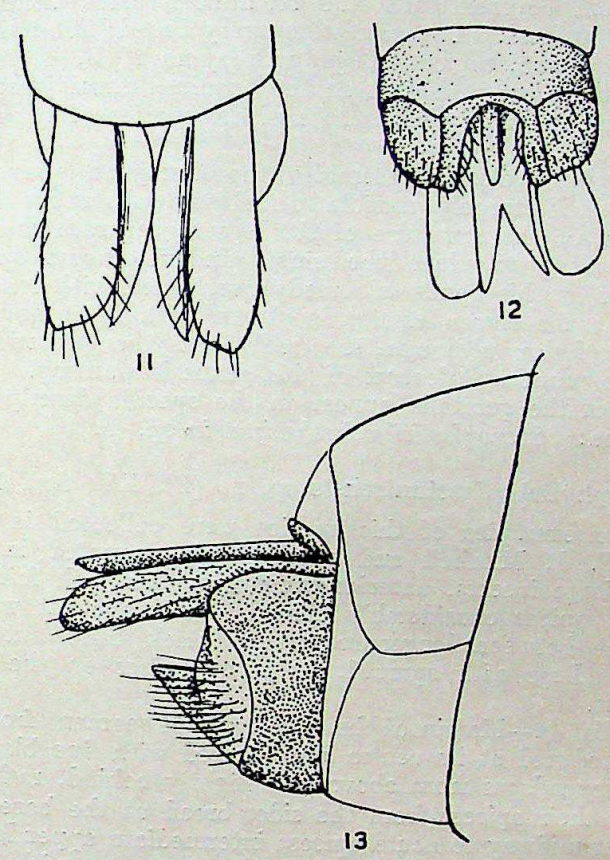
(*a*) a hyaline transverse spot at the base of second, third, fourth and fifth apical cells;
(*b*) a large irregular spot at the end of the thyridial cell and in the sub-discoidal area;
(*c*) a small transverse narrow spot before the pterostigma;
(*d*) a small spot at the end of the sixth apical cell;
(*e*) along the veins and on costal and post-costal areas there are small pale dots.

Neuration black; posterior wings sub-hyaline; the fourth apical cell at the base as broad as the second; cubitus furcate at the quarter beyond the level of the discoidal cell.

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Genitalia ♂.—Superior appendages blackish; from the side, superior margin convex, inferior slightly concave; the apex slightly



Figs. 11–13. *Anabolia oculata* Mart., ♂. Fig. 11, genitalia dorsal. Fig. 12, ventral. Fig. 13, lateral (after Martynov).

bent downwards; they are narrow, entire (not divided at the end); intermediate appendages (tenth segment) black, divergent and as long as in European species; side-pieces of the ninth ventral segment large, posterior margin impressed and covered with black hairs; inferior appendages forming a narrow margin along the edge of the ninth ventral segment (beneath), with ends produced somewhat triangularly (if seen from the side), all these anal parts blackish; penis not exserted.

Length of body 13 mm.; expanse 35 mm.

♂.—Tibet Orient; -vii-1901, Kozlov.

Stenophyliella gen. n.

Maxillary palpi ♂, first joint rather more than half the length of the second which is slightly shorter than the third. Antennae

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longer than the anterior wing, basal joint large, the second very short, about half the length of the following ones. Wings large, anterior brownish with faint yellowish annulations, membrane not granulose and covered with fine recumbent black hairs, apices considerably dilated. Posterior wings very broad; sub-hyaline, no scales in the anal region. Legs with spurs 1, 3, 4 and black spines but there are no spines on the terminal tarsal joint. Genitalia showing an affinity with those of the species of *Pseudostenophylax*.

Stenophyliella closely resembles the European genus *Stenophylax* and it is scarcely possible to find any substantial difference in neuration or the armature of the legs to separate them. But I am unwilling to place the single Indian known species in *Stenophylax* as this genus is already overloaded with incongruous forms and a far closer affinity is shown with Martynov's genus *Pseudostenophylax* although the scales on the posterior wings, which are a prominent feature of this genus is wanting.

Details of the genitalia appear in the specific description.

Genotype: *Stenophyliella kashmirensis* sp. n.

Stenophyliella kashmirensis sp. n. (Pl. XV, figs. 1-6).

The two examples of this species were collected in fluid by the late F. J. Mitchell and subsequently mounted in balsam. They are large insects, anterior wings brownish with faint yellow irrorations, apices considerably dilated, membrane set with short black setae between longer recumbent black hairs but scarcely granulose. Legs with spurs 1, 3, 4; no spines on the terminal tarsal joint.

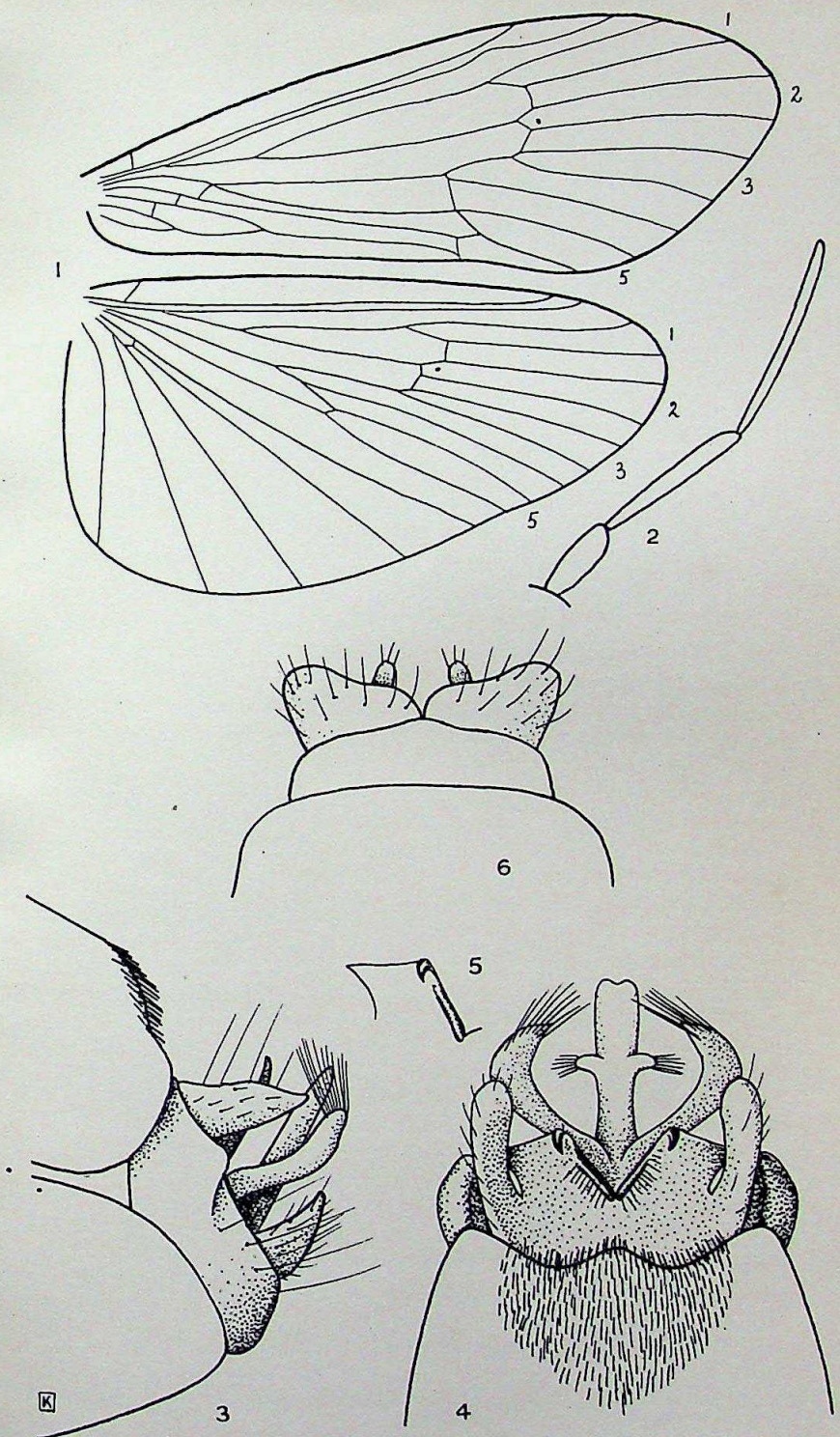
Genitalia ♂.—Margin of the eighth dorsal segment from above, slightly produced at its centre and covered with fine black setae; superior appendages from above and slightly behind, rather large, dilated at their apices; from the side, broad at the base tapering from about midway to acute apices; intermediate appendages from above and slightly behind, broad, apices truncate, with the inner angles turned upwards in acute blackened processes, the outer angles produced in broad triangular plates; the appendages are divided from each other by a wide triangular excision of which the margins are rolled over towards the base; from the side, the appendage appears as an upwardly directed blackened spur; penis straight, bearing two lateral processes about midway, one on each side making a cross, each furnished at its apex with long hairs, apex of the penis slightly excised; penis-sheaths appear as strong curving arms at the sides of the penis, caliper-shaped, apices curving inwards and furnished with bunches of bristles which meet inward across the penis, from the side they curve slightly upward; inferior appendages from the side narrow and pointed broader at the base; from beneath very broad, apices truncate or sinuous, each with a small blunt process towards its inner angle; ventrally the appendages nearly touch at their inner margins and are divided from each other by a narrow V-shaped excision.

Length of anterior wing ♂ 18 mm.

Kashmir, F. J. Mitchell.

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Stenophyliella kashmirensis sp.n., ♂. Fig. 1, wings. Fig. 2, maxillary palpus. Fig. 3, genitalia, lateral. Fig. 4, dorsal. Fig. 5, intermediate appendage, dorsal Fig. 6, inferior appendages, ventral.

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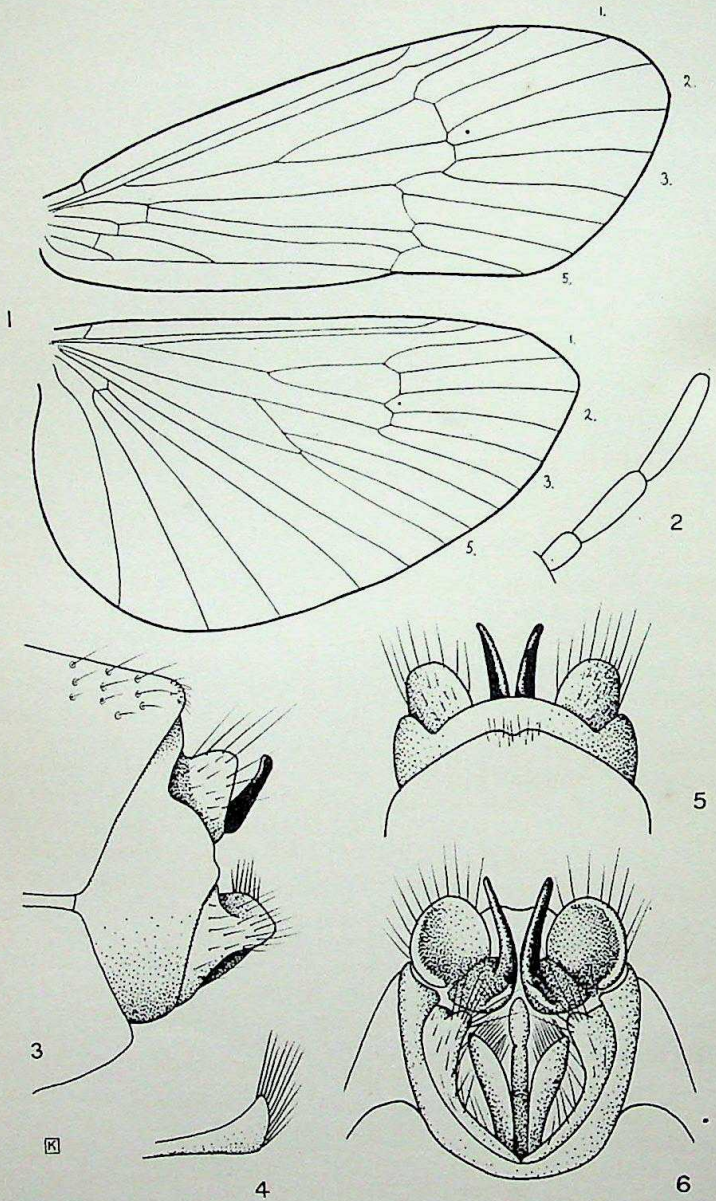
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Astenophylina kashmirus sp.n., ♂. Fig. 1, wings. Fig. 2, maxillary palpus Fig. 3, genitalia, lateral. Fig. 4, penis sheath, lateral. Fig. 5, genitalia, dorsal Fig. 6, from behind.

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Type ♂ and paratype ♂ in the author's collection, both mounted in balsam.

Astenophylina gen. n.

Insects large and brownish, wings rather short and rounded, sub-costa joined to the radius by a cross vein; first apical sector in each wing curved at its base; second apical cellule very broad at its base; discoidal cell short and broad in each wing; surface of the wings not granulose or set with short stiff hairs. Maxillary palpi very short, no longer than the labial palpi, but possibly abnormal in the unique type; basal joint very short, second joint slightly shorter than the third. Legs, spurs 1, 3, 4; terminal tarsal joints furnished with black spines. Genitalia conforming with the *Pscudostenophylax* group in respect to the fringed penis-sheaths and small inferior appendages, but without the black setae bordering the margin of the eighth segment.

Astenophylina kashmirus sp. n. (Pl. XVI, figs. 1-6).

The unique type was collected in fluid and subsequently dried out and set; beyond that it is a brownish insect, it would hardly be safe to give a description of its general appearance; characters other than genitalia are noted in the generic description.

Genitalia ♂.—Margin of the eighth dorsal segment without any mat of black setae; in the unique type, the ninth segment is rather extruded, its dorsal margin rounded; superior appendages short and rounded, ear-shaped, fringed with long fine hairs, triangular from the side with a wide base; between them, from above, are the intermediate appendages which are narrow, strongly chitinised with approximate bases and widely divergent apices; from the side, directed upward; penis, from beneath, slender, with an ovate apex and two stout sheaths each broadened at its apex and with a produced upper angle as seen from the side; inferior appendages short and triangular, welded to the ninth segment, fringed with long black hairs; ninth ventral segment deeply excised with a large rounded excision.

Length of anterior wing 15 mm.

India; Kashmir, R. Arrah, F. J. Mitchell.

Type ♂ presented by the author to the British Museum.

Stenophylax (Allophylax) indicus Navás.

Stenophylax (*Allophylax*) *indicus* Navás.—Mem. Ac. Pont. Rome, (2) Nuov. Linc., iii, pp. 9-10, 1917.

I am unacquainted with this Darjiling species and therefore give the description as written by the author. No figures are given.

'Caput, palpi, antennae testaceae, pilis testaceis; ocellus plumbeis; oculi fuscis.

Thorax fusco-ferrugineus, pilis fuscis.

Abdomen testaceo-ferrugineum, pilis testaceis brevibus, sparsis; ultimo tergito ♂ denticulis nigris toto vestito, margine postico truncato; cercis superioribus brevibus, intermediis adscendentibus

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acutis; copulatore exerto cylindrico; lamina subgenitali seu ultimo sternito in processum longum filiformen cylindricum producto. Pedes testacei, pilosi, nigro setosi, calcaribus 1, 3, 4 longis, fulvis.

Ala anterior in tertio apicali lata apice rotundata; margine externo obliquo; membrana tota minute granulata, leviter fusco tincta, pone procubitum usque ad marginem posticum densius fuscata; tota maculis sive guttis parvis rotundatis pallidis conspersa, in tertis posteriore distinctioribus; stria pallida ad thyridium; pubescentia brevi, fusca; fimbriis brevibus, fulvis; reticulatione fulvo-testacea; cellula discali, longissima, saltem quater longiora suo petiolo; furca apicali prima parum intra cellulam discalem penetrante. Ala posterior basi lata, apice parabolice rotundata; membrana tota minutissime granulata vel potius impresso-punctata, hyalina, levissime fulvo tincta, distinctus in tertio apicale; pubescentia fimbriisque fulvis; reticulatione fulvo testacea; cellula discali longa, bis vel ter longiore suo petiolo, furca apicale prima parum cellulam discalem penetrante.

	♂	♀
Long. corp.	14 mm.	13 mm.
Long. ala post.	18.5 mm.	17 mm.
Long. ala post.	15.5 mm.	14.7 mm.

Patria Asia. Darjeeling in montibus Himalaya 1910 (Coll. m.). Si formam cellulae discalis attendas haec species ad genus *Allophylax* Banks referenda; sed genus hoc mea sententia omittendum, quod charactere parum conspicuo et definito nitatur- videlicet cellulae discalis et furcae apicalis primae longitudine quae summopere variat.'

The presence of the genus *Stenophylax* Kol. in India requires confirmation, so I defer giving a description of the genus for the time being.

Apataniinae Ulmer.

Apataniinae Ulmer.—Ab. Natur. Ver. Hamb., xviii, pp. 42, 74, 1903.

The *Apataniinae* are separated from the *Limnophilinae* by the abnormal neuration of the anterior wing in which the sub-costa ends in a cross vein joining the radius and costal margin instead of continuing directly to the margin.

[1]The Indian fauna so far known contains only the two genera *Apataniana* and *Apatidea* separated as follows:

Table of Genera.

1. Discoidal cell of the posterior wing present. Apataniana nov. gen. p. 475
—Discoidal cell of the posterior wing absent. Apatidea McLach. p. 476

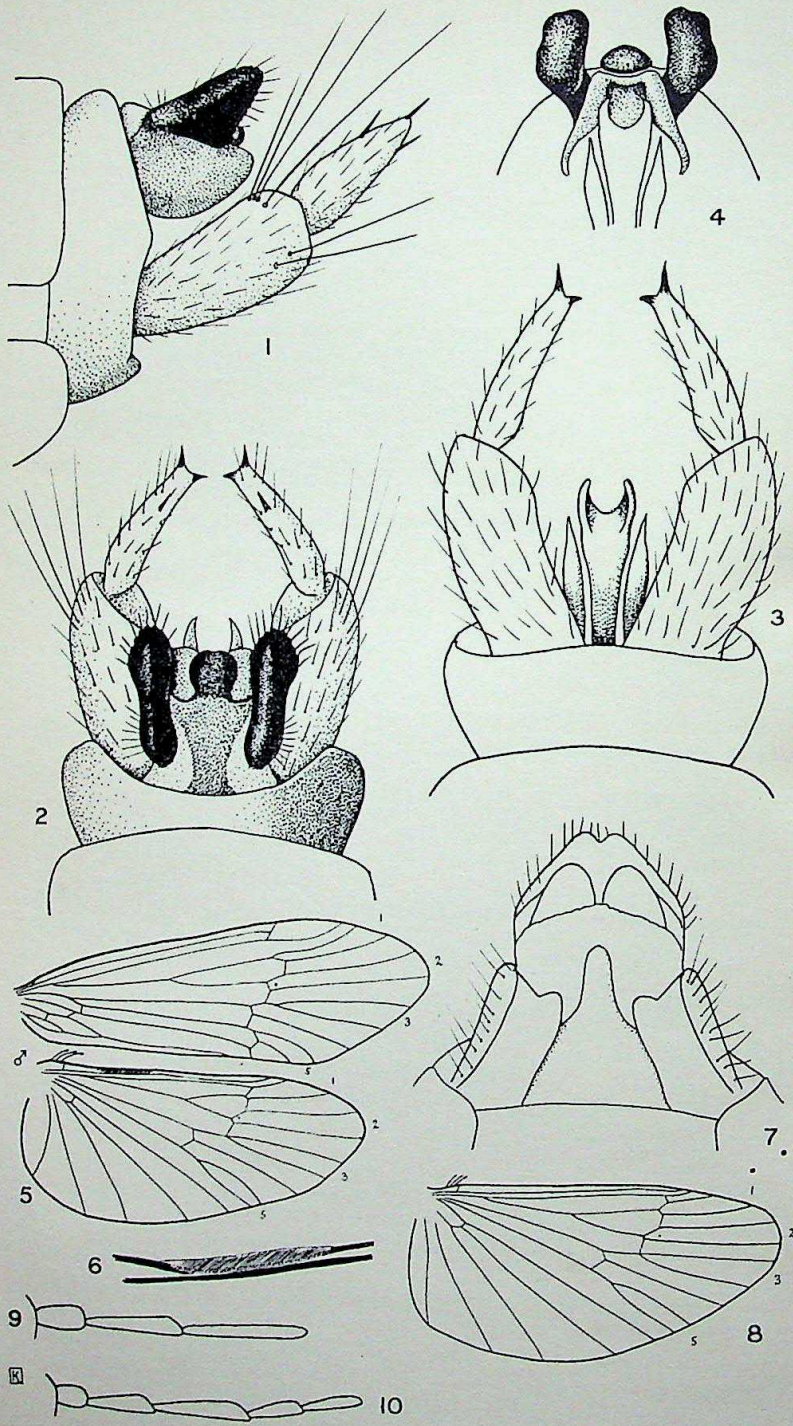
[1] Since this part was sent to press, a large collection has been received from Assam and Burma containing at least one new genus in this sub-family. A description will appear later on in a supplement.

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Apataniana hutchinsoni sp.n. Fig. 1, genitalia ♂, lateral. Fig. 2, dorsal. Fig. 3, ventral. Fig. 4, apices of superior appendages and penis, etc., ventral. Fig. 5, wings ♂. Fig. 6, costal margin of posterior wing ♂, enlarged. Fig. 7, genitalia ♀, ventral. Fig. 8, posterior wing ♀. Fig. 9, maxillary palpus ♂. Fig. 10, maxillary palpus ♀.

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Apataniana gen. n.

The genus has been erected to take the new species *hutchinsoni* in which the characters of neuration differ considerably from all other genera in the *Apataniinae*.

Maxillary palpi ♂, first joint about half the length of the second which is slightly shorter than the third; ♀, first joint less than half the length of the second, third joint almost as long as the first and second together, fourth joint slightly shorter than the fifth which is about twice the length of the first. Antennae slender, about the same length as the anterior wing; basal joint large, second short, remaining joints each longer than the second. Wings; anterior alike in both sexes; sub-costa running into a cross vein joining the costa to the radius, forks Nos. 1, 2, 3 and 5 present, discoidal cell closed, moderately long and narrow; posterior wings broader than the anterior, sub-costa parallel with the radius, construction differing in the sexes; in the ♂ there is a narrow fold or flap along the costal margin towards the base of the wing lined with coarse yellow hairs; this fold is wanting in the ♀; discoidal cell closed, forks Nos. 1, 2, 3 and 5 present; in the ♂, radius running into the first apical sector, first apical fork short and rather broad at the base, second as long as the third which is sessile, fifth short and with a distinct foot-stalk. Spurs 1, 2, 4.

Genotype: *Apataniana hutchinsoni* sp. n.

Apataniana hutchinsoni sp. n. (Pl. XVII, figs. 1-10).

Head dark fuscous with light honey-coloured hairs; palpi dark fuscous; antennae dark ochraceous with narrow black annulations; prothorax, mesothorax and metathorax black; legs ochraceous, spurs black, 1, 2, 4.

Wings, anterior greyish with honey-coloured hairs; whitish patches along the apical border between the apical sectors, posterior wings greyish, ♂ with a fold, filled with yellow hairs in the costal margin towards the base.

Neuration as shown in Pl. XVII, figs. 5-6, 8.

Genitalia ♂.—Margin of the ninth dorsal segment very broadly and shallowly excised; there are two short black superior appendages, apices somewhat dilated and serrate. Between them is a dorsal plate narrow at the base, broadening in two wide lateral triangular shelves; the apex of the dorsal plate is produced in a rounded blackened process; beneath this plate is a strongly chitinised arched structure, sides very deep and slightly inturned beneath; penis from beneath, narrow at the base, broadening to a widely excised apex; there is a pair of penis-sheaths, one on each side, rather shorter than the penis, inferior appendages two-jointed, basal joint very stout, terminal more slender, slightly shorter, apex armed with two or three short acute spurs; there is also a single spur on each joint slightly before the apex.

Genitalia ♀.—Beyond the terminal dorsal segment is a small penthouse-shaped process with a slight excision at the apex; from beneath there are two chitinous plates towards the apex;

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below this is the long central lobe of the vulvar scale, the outer lobes being formed by the produced lateral margin of the terminal segment.

Length of anterior wing ♂ and ♀ 10 mm.

Western Tibet; Kyam, 19-25-vii-1932, G. E. Hutchinson, Yale North India Expedition, 7 ♂♂, 1 ♀.

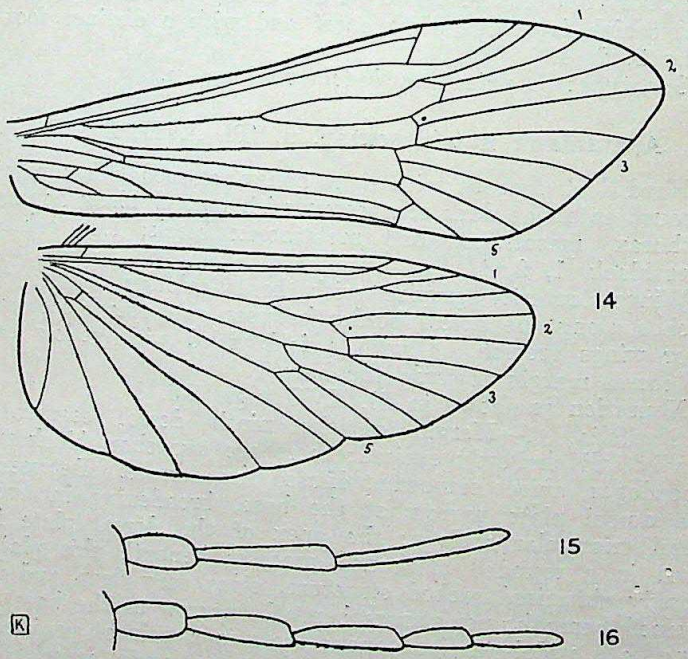
The collector, Dr. Hutchinson, to whom I have much pleasure in dedicating the species, states that the examples were all found under stones.

Type ♂ and paratypes ♂ and ♀ in the collection of the British Museum. Paratypes ♂ in the collection of the Yale University, U.S.A.

The genitalia of *hutchinsoni* closely resemble Martynov's figures of *Apatania bulbosa* which in the ♂ posterior wing also displays the narrow costal fold with the yellow hairs but in respect to other features of neuration, *bulbosa* is very abnormal.

Apatidea McLachlan (Text-figs. 14-16).

Apatidea McLach.—Rev. and Syn. Trich., p. 217, 1876.



Figs. 14–16. *Apatidea brevis* spn., Fig. 14, wings ♂. Fig. 15, maxillary palpus ♂. Fig. 16, maxillary palpus ♀.

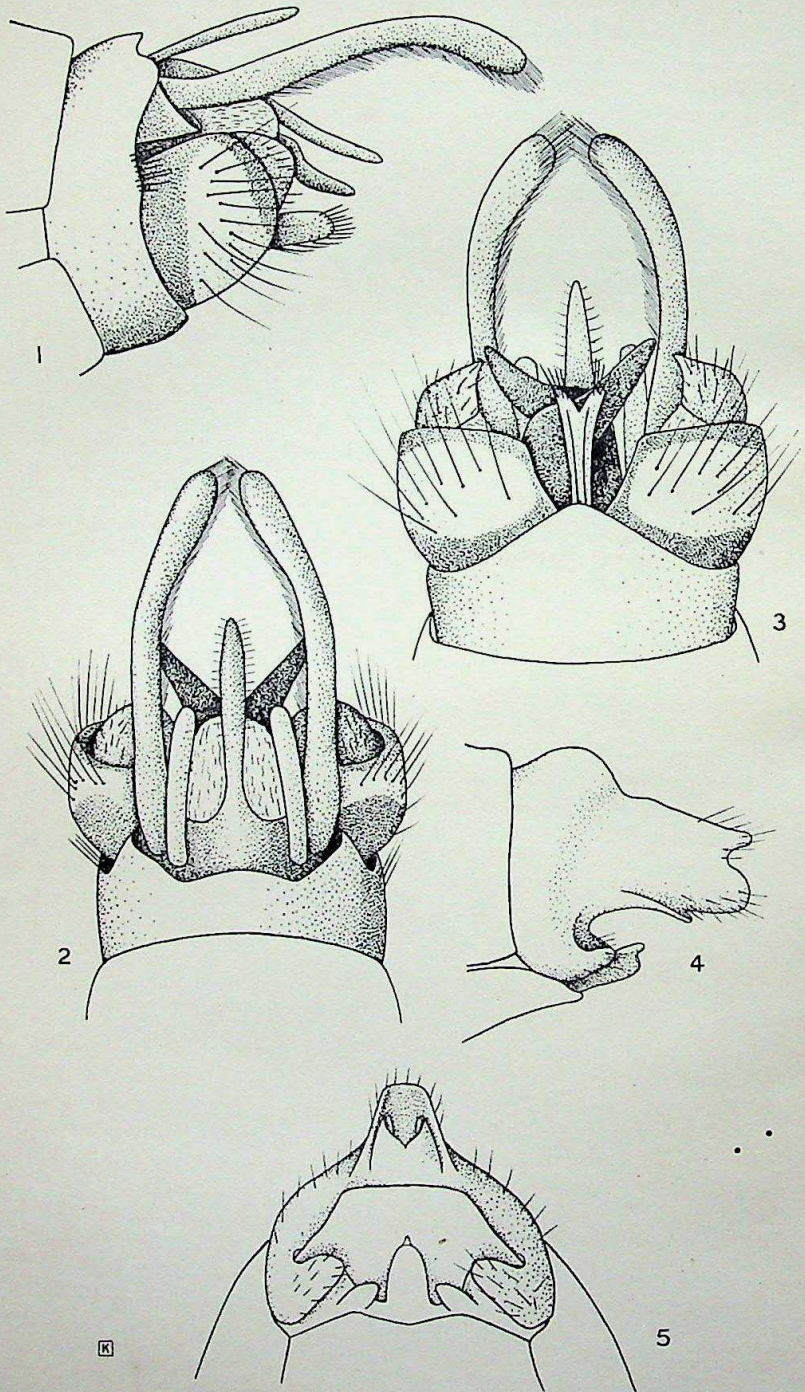
Apatelia Wallengren, subgenus of *Apatania*.—Ent. Tidsk. Arg., 7, H. 2, p. 78, 1886; Skand. Neur.—Kongl. Sv. Vet.—Akad.

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Apatidea brevis sp.n. Fig. 1, genitalia ♂, lateral. Fig. 2, ♂, dorsal. Fig. 3, ♂, ventral. Fig. 4, genitalia ♀, lateral. Fig. 5, ventral.

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Handl., Bd. 24, N. 010, p. 88, 1891; Martynov.—Ann. Mus. Zool. Ac. Sci., xxii, pp. 59, 63, 1918.

Maxillary palpi ♂, first joint about half the length of the second which is slightly shorter than the third; ♀, basal joint short, about two-thirds the length of the second, third equal to the second, fourth equal to the first and slightly shorter than the fifth. Antennae, basal joint large, the second very short, remaining joints each longer than the second. Anterior wing; the sub-costa ends abruptly in a transverse nervure joining the costa and radius; radius heavily fringed with short thick hairs; discoidal cell long and narrow, upper margin slightly excised, first apical cell very acute at its base, second, third and fourth truncate, fifth with a minute foot-stalk. Posterior wing; the radius is arched towards its distal end to touch or nearly touch the sub-costa; sometimes not suddenly arched but confluent at a point towards the distal end, sometimes joined by a minute cross vein: lower margin of the wing slightly scalloped.

Spurs 1, 2, 2 or 1, 2, 4 ♂ and ♀.

Genotype: *Apatidea copiosa* McLach.

A few words are required in explanation of the synonymy. The sub-genus *Apatelia* was erected by Wallengren in 1886 to take the species *inornata* Wallengr. and *fimbriata* Pict. in both of which the radius and sub-costa are partly confluent in the posterior wing. In 1918 Martynov raised the sub-genus to full generic status. At the same time, he revised McLachlan's genus *Apatidea* in which two species had been described, *elongata* McLach. and *copiosa* McLach. placing the former in *Apatania* and the latter in *Apatelia* with the consequent entire disappearance of McLachlan's genus. In *copiosa*, the neuration of the posterior wing is similar to that of *fimbriata*.

Martynov in this transgressed the laws of priority, McLachlan's *Apatidea* having been erected ten years prior to *Apatelia* Wallengr. As neither McLachlan nor Wallengren selected genotypes of their respective genera, I here fix *copiosa* McLach. as the genotype of *Apatidea* McLach. 1876 and *fimbriata* Pict. as the genotype of *Apatelia* Wallengr. 1886, the latter genus thus becoming a synonym.

Apatidea brevis sp. n. (Text-figs. 14-16, Pl. XVIII, figs. 1-5).

Head and oculi black, particularly the oculi; palpi fuscous; antennae fuscous, no noticeable annulations; prothorax, mesothorax and metathorax dark fuscous. Wings, anterior castaneous posteriorly rather paler, for neuration, see text-fig. 14. Legs fuscous, spurs 1, 2, 4; abdomen castaneous, paler beneath.

Genitalia ♂.—The margin of the ninth dorsal segment widely excised with the central portion of the excision slightly produced and rounded, sides curling slightly under to make sockets from which arise the intermediate appendages; beyond it is a median process, wide at the base and produced in a long, slender, tailwardly and downwardly directed finger; on each side of this process are the superior appendages which are considerably shorter than the median process; intermediate appendages very long and

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strongly chitinised, heavily fringed, apices dilated and turned slightly downward; penis narrow, apex widely furcate, apex of each fork bearing two or three spines, beneath the penis are two long thin spines which are divergent so that they lie closely under the forks of the penis; penis-sheaths wide at their bases which cross, one over the other so that the narrower apices are widely divergent; inferior appendages two-jointed, basal joint short, very stout and round, terminal joint turned in and rather pointed.

Genitalia ♀.—From beneath, tubular piece narrow, central lobe of the vulvar scale broad and long, from the side, very deep, upper margin produced to make a small finger; side lobes very short and rounded; there is a broad, transparent sub-genital plate welded beneath to the tubular piece which, from the side is widely cleft.

Length of anterior wing ♂ 5.5-10 mm.; ♀ 8-10 mm.

Kashmir; Gagirbal, 5,190 ft., F. J. Mitchell, numerous ♂♂ and ♀♀; Killanmarg, 10,500 ft., 13-vii-1931, Fletcher Coll., 2 ♂♂, 19-22-vii-1923, Fletcher Coll., 1 ♂.

Type ♂ (Gagirbal) in the author's collection; paratypes ♂ and ♀, details as above, in the author's and the British Museum collections.

The species is very variable in size, the dimunitive ♂ with a 5.5 mm. wing being recorded from Kashmir, Killanmarg, 10.500 ft., the larger from Kashmir, Gagirbal, at 5,190 ft. *Brevis* bears a close resemblance to the Turkestan species *Apatidea copiosa* McL. but differs in the arrangement of spurs and in the length of the superior appendages which, in *copiosa*, are longer instead of shorter than the median process.

(*To be continued*).

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Tapir shot by the author.



Young tapir caught by the author after its mother was shot in Tavoy.

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THE MALAY TAPIR (*TAPIRUS INDICUS*).

BY

W. S. THOM.

(*With one plate*).

The Burmese call the tapir *Kyan-thu-daw*. I have never heard it called *Tarashu*. *Tarashu* does not appear to me to be a Burmese name although it is mentioned in the *Fauna of British India*, and in E. H. Peacock's book *A Game Book for Burma*. The name may be peculiar to Tavoy or Mergui where alone in Burma this animal is found, and where true Burmese is not spoken.

The tapirs, rhinoceroses, horses and wild asses, are included in the Perissodactyle or Three-toed Ungulates. Five species of tapirs are known to exist: of these four are confined to Central and South America; while the fifth is an inhabitant of the Oriental region, where it is found only in Lower Burma, the Malay Peninsula and Sumatra. The fact that tapirs are now found in limited areas separated by many thousands of miles from each other provides a good instance of the rare phenomenon of 'Discontinuous Distribution'. We know that in past geological epochs tapirs were abundant over a large portion of the Earth's surface. Their fossil remains have been dug up in many European countries. One explanation is that the tapirs were once prevalent in the northern countries. Owing to changes of climate and other conditions which are not very clear, they migrated southwards, and the existing tapirs now found in the Malay countries and America are the descendants of these emigrants. Or it may be that tapirs were once continuously distributed over the Earth's surface from north to south, that they ceased to exist in the northern countries and we have now only to deal with the few scattered remnants of what was once a widely distributed tribe.

The Malay Tapir, which is the largest of the group, is readily distinguished from all its South American cousins by the parti-coloured hide of the adult; the head, limbs, and front part of the body being dark brown or black, while all that portion of the body situated behind the shoulders including the rump, and the upper part of the thighs, together with the tips of the ears, are greyish white, or white in the adult. In very young animals on the other hand, that is to say those not exceeding from four to six months in age, the ground colour is blackish-brown or black marked (as in the young of the American species), with longitudinal streaks of yellow on the under parts. The hair too is markedly denser than in the full-grown animal. In height an adult tapir stands from three to three and a half feet at the withers and about four inches more at the rump; the length from the tip of the snout to the root of the tail measured along the curves of the body being about eight feet.

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Its habits are in all probability very similar to those of the American representatives of the genus. Like the rhinoceros, tapirs love wallowing in water and in mud holes in the deepest recesses of the jungle. Another habit common to tapirs and some rhinoceros is that their droppings are sometimes found in large heaps. They also browse on twigs and leaves like rhinoceros. All tapirs are extremely shy and retiring animals dwelling amid thick jungle in the neighbourhood of water to which they take readily. They are easily tamed and make very docile pets, following one about like a dog. A young one was caught in Tavoy, Lower Burma, 26 years or so ago and presented to Major Reid, a one time Deputy Commissioner of Tavoy. This animal was, if I mistake not, subsequently given to Colonel King, I.M.S., Burma, who presented it to the Maharajah of Mysore, India. I wonder if it is still alive. These animals are generally nocturnal in their habits. Their sense of sight, smell, and hearing is very acute. I should say that their sense of scent was equal to that of any deer, elephant, wild cattle, thakin, or rhinoceros. I would also go as far as to say that their sense of sight is more acute than that of any animal to be found in the jungles of Burma. I have tracked up and followed tapir on many occasions accompanied by only one experienced Burman hunter, and although we could both cover the ground as noiselessly as cats, the animals invariably stampeded before we came up with them and made off at a lumbering gallop uttering a succession of squeaks and snorts. My intention on those occasions was not to shoot the animals but to study their habits and also to get a photograph. These animals are rarely met with during the day unless they are tracked up to their resting places and wallows or are driven out of their haunts by the larger felines or by beaters. They usually inhabit low-lying, flat, damp, swampy ever-green forests, but in Tavoy I have also come across them in jungle in close proximity to villages. They are, if I am not mistaken, never found in hilly country so far as Burma is concerned. I do not suppose any sportsman in Burma has seen as many tapir in their wild state as I have over a period of about two years. It may be thought that being such shy and timid animals they would be found far away from human habitations, but I have found their tracks in dorian and jackfruit gardens adjacent to villages. In the *Bombay Natural History Society's Journal*, vol. xx, No. 2, dated the 18th October 1910, p. 515, Mr. J. B. Mercer-Adam, F.C.H., of the Forests stated that a Burman of Kado village, Moulmein, had seen a tapir in his garden in the evening. The Burman although he did not recognize it as a tapir described it as a very large pig, half black and half white. Both tapir and rhinoceros revel in a country where the forests are dense and where the rainfall is heavy. Tapir never inhabit the high mountainous country frequented by the Sumatran rhinoceros (*R. sumatrensis*).

The Malay Tapir, which like rhinoceros is now entirely protected, offers little attraction to a European sportsman since it yields nothing in the way of a trophy except the skull,

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skin and hoofs, and it is not given to charging or attacking human beings.

No European, Burman, Indian, or Karen hunter seeks to kill or catch tapir unless it be to capture a young for sale to some Indian prince or zoo; as their blood, unlike the two species of rhinoceros found in Burma, viz. *R. sumatrensis* and *R. sondaicus*, appears to possess no valuable properties. Any animal captured alive would of course belong to the Forest Department as it would come under the nomenclature of forest produce. A good many of these animals were trapped in pits and nets during beats in the bad old days for food principally, not only in Burma but in the Malay States. The residents of the two districts of Tavoy and Mergui however consider it a sin to kill a tapir; because, as the legend has it and as its Burmese name, *Kyan-thu-daw*, seems to imply, the animal is considered to be holy and more or less sacred because periodically about the full and new moon it visits the nearest salt-lick or hot sulphur springs of mineral and saline mud in the vicinity of its haunts as if to go into retreat, or to make as it were its orisons. The word *Kyan-thu-daw* literally translated would mean *Kyan* a rhinoceros and *thu-daw*, a person devoted to the service of religion, or in other words the worshipping or holy tapir; although why they should prefix the word *'Kyan'* before the *thu-daw* I am unable to say. It may perhaps be because the shape of the animal's foot is not unlike that of a rhinoceros. Indeed, in the old days, newcomers when out after game in the Tavoy and Mergui districts often mistook the tracks of a tapir for those of a small rhinoceros. Rhinoceros as a matter of fact visit salt-licks at regular intervals, once or twice a month with the new and the full moon as do tapir, and perhaps the Tavoyans and Merguians consider the tapir to be a religious attendant or follower of the rhinoceros; hence the name *Kyan-thu-daw*.

The first and only tapir bagged by me was in the Tavoy District. It was at a place called Mijyaunghlaung (the resort of crocodiles), where a magnificent morass of hot bubbling sulphur springs of mineral water and mud may be found situated in the heart of virgin tree, bamboo and cane forest, a veritable health resort of all wild animals who partake of the mud and waters in order to rid themselves of internal parasitic worms. As a matter of fact I was not out after tapir at the time but after 'tsaing' or banting (*Bibos banting birmanicus*) and bison (*B. gaurus*).

The water and mud in this morass or swamp was so hot that one could not walk in it bare-footed. The surface was pitted with the tracks of elephant, bison, tapir, sambar, hog deer and 'tsaing', I heard the lumbering galloping sounds of the tapir's hoofs approaching, so unlike those of any other animal, excepting perhaps the buffalo and the rhinoceros. It was conjectured that it must be one or other of these and not a female tapir with a young one. It was all over in a few seconds. The jungle was dark and gloomy and objects were not easily discernible; the animal consequently as she galloped past received before it was known what manner of beast she was, a right and a left

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behind the shoulder from a 12-bore 'Cosmos' ball and shot gun, which brought her to the ground with a crash into a nullah 150 yards further on, shot through both lungs. The young one which appeared in view some 50 yards or so behind its mother after I had fired at the latter, was captured after a short struggle and kept alive for a period of about a month when it succumbed to shock and blood poisoning in spite of every attention and a liberal use of antiseptics, as it was found that both it and her dam had been badly mauled either by a leopard, wild dogs, or a tiger. Probably it was a leopard that had attacked them with the object of making a meal of one or both; but had been frustrated in the attempt. The young one became so tame before its death that it used to follow me about when I called it, and eat plantains and jackfruit and the leaves of the latter tree from my hands.

The tapir has no means of defending itself with the exception of the kicking power of the hind legs which are not however propelled with sufficient force to be of much use as a means of defence sufficient to ward off an attack from the 'felidae' and wild dogs, their only enemies besides Man. The shape and position of the snout of the animal also makes any attempt at using its teeth with any great hope of success, well nigh impossible. If the hind legs could be used with the rapidity and force employed, shall we say, by an ostrich, horse, elephant, bison or even a mule, it might have some chance of holding its own. It is probably due to the tapir's acute sense of smell, sight and hearing that it is saved from early extinction. Its snout, like the trunk of an elephant, is extremely sensitive to pain and a struggle between a tapir and either a leopard, tiger or a pack of wild dogs would invariably end in the death of the tapir. The feet or hoofs make excellent trophies if properly mounted by a good taxidermist. I have all four feet of the only tapir shot by me beautifully mounted by Messrs. Rowland Ward, two of them as spirit cheroot lighters, one as a call bell, and the fourth as an inkstand. The flesh of the tapir although coarse is palatable enough and not unlike that of rhinoceros meat, but neither animal is sought after on account of its meat. The people moreover believe that the consumption of tapir flesh tends to cause leprosy which of course is a fallacy like many other of their beliefs.

Before ending my article on Tapir I would like to quote here a few extracts from an article which was published in the *Rangoon Gazette* of August 1935 by a correspondent of that paper, and which seems to me very apt. 'Nature', he says, 'is capable of surprises and even jests that upset our pre-conceived notions and theories, and not the least remarkable of these surprises is the tapir described by Mr. H. C. Smith, Honorary Game Warden of Burma, in his series on the wild animals of Burma'.

'When we think of wild animals we instinctively divine the thought further with recollections of animals we have read or heard or seen in zoos and films, we have had witness of the ferocity of the tiger and the lion; there is a smile for the antics of the monkey tribe, or for the ungainly absurdity of the rhinoceros

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on his stumpy legs; and there is wonder and delight at the swift grace of the deer and antelope tribes. But what shall we say of the tapir? It is a perpetual refutation of the general application of theories on the struggle for existence. It is a shy and mild and gentle creature. It is easily tamed in captivity. It is nothing much to look at and its white overcoat is an amusing vagary of jungle fashion. The female is bigger than the male. A small shrill squeal is the only sound recorded in connection with the animal. It likes water and is credited by some with the extraordinary power of walking along the bottom of deep pools instead of swimming. It wanders silently and unobtrusively in the densest evergreen. It is not poached, the jungle people regarding it as is the fate of many philosophers living out of their time with "almost amused contempt". And the tigers do not seem to kill it. It is, as Mr. H. C. Smith remarks, a harmless and interesting animal. The tapir is in fact an enigma. It may be a survivor of some more gentle and legendary time, or it may be wandering in unique isolation in a world not yet mature enough for its wisdom. We should therefore cherish and protect the tapir, just as so many of the wild animals of Burma should be protected in case they are exterminated."

Alas I am afraid I must plead guilty to having shot one of these inoffensive animals under rather peculiar circumstances in the Tavoy District many years ago, in the year 1909 to be exact, i.e., some twenty-six years ago. I wrote an account of this animal's death at the time and also described the tapir and its habits in detail. This appeared in a number of the *Asian* sporting paper which has now been defunct for many years.

These reminiscences of mine are after all of days gone by when much game was shot by sportsmen. This is a new age of licenses, game laws and protection. The old days are gone never to return.

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THE ORNITHOLOGY OF TRAVANCORE AND COCHIN.

BY

SĀLIM ALI.

With Notes by HUGH WHISTLER.

PART IV.

(*Continued from page* 320 *of this volume*).

FAMILY: SYLVIIDÆ.

Acrocephalus stentorius brunnescens (Jerdon). The Indian Great Reed-Warbler.

Specimens collected: 286 ♀, 287 ♂ 15-2-33 Kottāyam S.L.; 422 ♂ 7-3-33 Kūmili 3,000 ft.; 1041 ♂, 1042 ♀ 30-12-33, 1052 ♂ 31-12-33 Karūpadanna ca. S.L.

Elsewhere noted at: Vembanād Lake (Trivandrum Environs).

Colours of bare parts: Iris hazel to olive-brown; bill, upper mandible excluding commissure horny-brown, commissure and lower mandible pale flesh colour, horny at tip; mouth bright orange-brick colour; legs and feet horny-grey or pale plumbeous; claws duskier.

[The Survey specimens measure:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂	24.5-26.5	87-94	76-84.5	27.5-29.5 mm.
2 ♀♀	25.5-26	85-90	76-79	28 mm.

Additional specimen from Travancore examined:

Brit. Mus. Coll.: ♀ 26-4-1910 Thodupuzha (Nair).

In *J.B.N.H.S.*, vol. xxxv, p. 450, I threw doubt on the validity of the resident breeding race in Ceylon *A. s. meridionalis* (Legge), as the two specimens in the British Museum did not appear to me to be separable. Owing to the courtesy of the Director of the Colombo Museum I have examined four more specimens from Ceylon. Two of them are undated and one unsexed, whilst one of the others is very worn, but the series, so far as it goes, makes me more prone to accept the probability of a small and very dark Cinghalese race. Further material is required to settle the point, as although Mr. Stuart Baker (*Nidification*, ii, 356) accepts it, he considers it intermediate in character between *brunnescens* and his race *amyae*. The probability that true *brunnescens* reaches Ceylon as a winter visitor, living then alongside a resident separable race, must also be borne in mind.

In the *New Fauna*, ii, p. 388, the genus *Acrocephalus* is said to undergo a complete moult both in autumn and spring; and it appears to be certainly correct that there are complete moults in spring and autumn in the closely allied *Acrocephalus arundinaceus* (vide *Practical Handbook of British Birds*, i, 335). After examining a very large number of *A. s. brunnescens* I can however only come to the conclusion that there is no spring moult. The complete post-nuptial moult takes place from September to November. So far as I can ascertain the post-juvenal moult is complete.

In fresh autumn plumage this form is distinctly washed with grey on the upper parts, more particularly on the crown and hindneck. With wear in summer the colour becomes much duller and browner.—H. W.]

There is nothing on record to show the status of the Indian Great Reed-Warbler in Travancore and Cochin. The latest date on which the Travancore Survey came across it was 7 March among scrub and bushes on a seepage marsh by the margin of Periyār Lake. The birds were common there at that

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time, but whether it is a resident species or not is doubtful. They were also abundant amongst the densely shrubbed bunds or dykes in the backwaters (consisting of *Pandanus* and clumps of tall coarse grass) where the birds hopped about in the undergrowth, occasionally clambering up into the overhanging fronds of cocoanut palms. It frequented similar environment at Karūpadanna and about the Vembanād Lake. Specimen No. 1052 was a solitary bird obtained among bushes growing on a spit of dry sand on the sea-shore.

Besides the loud, harsh and often ventriloquistic song of the male which is uttered from exposed perches on bushes and the like, it has a harsh, single '*Ke*' like *Turdoides*, uttered every few seconds and also a '*chr-r, chr-r*', etc. similar to but much louder than that of the more familiar Blyth's Reed-Warbler.

Breeding: The gonads of the specimens were in an undeveloped condition. No. 1042 (30 December) was immature with two imperfectly ossified patches on the anterior part of the skull. No record of its breeding in this area exists, though it is not inconceivable that it may do so about the backwaters.

Acrocephalus dumetorum Blyth's Reed Warbler.

Specimens collected: 69 ♀ 12-1-33, 96 ♀ 14-1-33 Marāiyūr 3,500 ft.: 113 ♂? 19-1-33 Mūnnār 5,000 ft.; 148 ♀, 149 ♀ 25-1-33 Sānthanpāra 3,500 ft.; 210 ♂ 4-2-33 Thattākād 200 ft.; 324 ♀ 21-2-33, 342 ♀, 343 ♂? 23-2-33, 360 ♂ 25-2-33 Peermade 3,200 ft.; 396 ♀ 3-3-33 Kūmili 3,000 ft.; 554 ♂? 10-4-33, 562 ♂? 11-4-33 Cape Comorin ca. S.L.; 960 ♂? Nemmāra 300 ft.

Elsewhere noted at: Kottāyam (ca. S.L.); Wūndāmet; Rājampāra (1,350 ft.); Tenmalāi (500 ft.); Kūriārkūtti (1,600 ft.); Wadakkāncheri (400 ft.); Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris hazel-brown (dark straw colour in one); bill, upper mandible horny-brown; lower mandible pale flesh colour; mouth orange-yellow or pale pinkish-yellow; legs, feet and claws greyish flesh colour; soles pale yellow. In the albino (No. 210): Iris olive-brown; bill pinkish flesh colour slightly brown on upper mandible; mouth orange-yellow; legs, feet and claws yellowish flesh colour.

[Additional specimens examined:

B. M. Coll.: ♀ 7-4-07 Manthukuly [Mūthūkūzhi ?], Travancore (Nair); ♂ 6-2-80 Mynall (Bourdillon); ♂? 7-3-77 Mynall (Hume Coll.).

Measurements:

	Bill.	Wing.	Tail.
1 ♂	17	63.5 ...	53 mm.
6 ♀♀	16-18	60-62.5	51.5-54.5 mm.

This common migrant arrives in India in worn breeding dress and the complete moult takes place from August to November, mostly in September and October. The spring moult, which I think is confined to the chin, throat and breast, is late, taking place about April and May. The upper plumage becomes much duller and browner by wear.

Some juveniles arrive in India before the post-juvenal moult. They may be distinguished, in addition to the softer character of the plumage, by being a more rusty-brown above, especially on the rump and upper tail coverts (thereby recalling *Acrocephalus scirpaceus*) and on the edgings of the wings and tail, the quill feathers being altogether duller and washed with this colour; the underparts are slightly paler.

I suggest that the post-juvenal moult is usually complete, but that some individuals do not moult the primaries, primary coverts, secondaries and greater coverts or the tail.—H. W.]

Blyth's Reed-Warbler is a common winter visitor to Travancore and Cochin. A marked decrease in its numbers was observed by the beginning of April. The last date on which the Survey came across it and obtained a specimen was 11 April, by which time most birds had departed. This specimen was very fat also, suggesting that it was ready to emigrate.

In the cold weather it is a common species in hills and plains alike, frequenting scrub country, hedges and brushwood. At Pādagiri (3,000 ft.) in the Nelliampathies it was particularly abundant in the dense bracken thickets on

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water-logged patches along the hillstreams, commonly in association with *Phragmaticola aëdon*. It hops about the undergrowth singly, incessantly uttering its single harsh note '*Tschuk*' at intervals of a few seconds, varied occasionally by '*chur-r-r*' or '*chr-chr*'. It is a great skulker and seldom shows itself.

It is also a winter visitor to Ceylon.

The gonads of all the specimens were in a quiescent state.

Acrocephalus agricola Jerdon. The Paddy-field Warbler.

Specimens not procured.

A single example was flushed in a field of standing paddy in a forest clearing at Thattākād (200 ft.), but its identity remains unconfirmed. It has not been obtained in Travancore or Cochin before, the nearest records being from the Wynaad (Hume, *S.F.*, x, 390) and the pair collected by William Davison in the Brahmagiri Hills, Coorg, in February 1883 now in the British Museum.

Locustella naevia straminea Seebohm. The Eastern Grasshopper Warbler.

Specimens not procured.

Noted at Marāiyūr (Annemalāi Hills) and Pādagiri (Nelliampathies). Ferguson (*J.B.N.H.S.*, xv, 456) records a specimen obtained in a swamp in Travancore at 4,000 ft. elevation during April 1901. I procured one in the Biligirirangan Hills (4,500 ft.—Coimbatore District) on 29-12-32.

This species, apparently a winter visitor, was not uncommon on hillsides covered with tall grass (*Andropogon* sp.) interspersed with dwarf date palms above Kodekkādū (near Marāiyūr) at between 5 and 6 thousand feet elevation, especially on the edge of sholas. It was also present in similar facies around Pādagiri.

The bird was invariably met with singly, uttering '*chek-chek*' or '*chur-r, chur-r*' from its concealment, something like the notes of Blyth's Reed-Warbler. It is a great skulker and flushed only with difficulty when almost trod upon. After flying a few yards it dives headlong into the grass stems and is well-nigh impossible to flush a second time. So swiftly does it thread its way through the stalks low down near the ground that by the time one reaches the spot where it dived it has vanished mysteriously, and no amount of trampling around will avail!

Orthotomus sutorius sutorius (Pennant). The Tailor Bird.

Specimens collected: 245 [♂] 8-2-33 Thattākād 200 ft.; 616 ♀ juv., 617 ♀ 18-4-33, 634 ♂ 21-4-33 Aramboli 250 ft.; 722 ♀ (imm.) 25-7-33 (Thirūmalāi 100 ft.); 757 ♂ 31-7-33 (Akkūlam 150 ft.); 896 ♂ (imm.) 13-8-33 (Nettāyam 200 ft.) Trivandrum Talūk; 948 ♀ 6-12-33 Nemmāra 300 ft.

Elsewhere noted at: Marāiyūr (3,500 ft.); Kottāyam (ca. S.L.); Peermade (3,200 ft.); Kūmili (3,000 ft.); Rājampāra (1,350 ft.); Trivandrum Town (ca. S.L.); Cape Comorin (ca. S.L.); Chālakūdi; Wadakkāncheri (400 ft.); Trichūr; Ernakūlam (ca. S.L.).

Colours of bare parts: *Adult*: Iris and eyelids orange-brown to orange-red; bill, upper mandible excepting commissure horny-brown, commissure and lower mandible pinkish flesh colour; mouth pale flesh colour; legs and feet brownish flesh colour; claws dusky. *Juvenile* (No. 616): Iris pale olive-brown; upper mandible horny-brown, lower mandible pale flesh; gape yellow; mouth pinkish-yellow; legs, feet and claws pale pinkish-flesh.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂	15-16	48-51	37.5-55	19-19.5 mm.
2 ♀♀	15-16	43-46.5	34.5-36.5	19 mm.

It is with considerable hesitation that I attribute this series to the typical race for it is in truth intermediate. In colour the specimens agree with the Indian form *O. s. guzerata* but they are rather small and in that particular agree with the Ceylon bird. Also No. 757 ♂ dated 31 July has the tail in moult and the new feathers appear to be of the long summer type, which suggests that in Travancore as in the typical race of Ceylon the long pointed feathers may be found throughout the year.—H. W.]

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The Tailor Bird is a common resident species in Travancore and Cochin, throughout the low country and up to at least 3,500 ft.—probably higher—in the hills. I do not seem to have come across it in the Nelliampathies, but Kinloch (*J.B.N.H.S.*, xxvii, 943) records it as common in those hills.

It frequents scrub and secondary jungle as well as hedges and shrubbery about cultivation and human habitations, being especially fond of the mango and jack-fruit gardens about homesteads along the backwaters.

In the Pālni Hills, Fairbank (*S.F.*, v, 406) records it from Shembaganur 5,500 ft. The typical race, *O. s. sutorius*, is also resident and common in Ceylon.

Breeding: On 15 April (Aramboli) a half-built nest was discovered in a small bush at 18 inches from the ground in fairly open scrub under a Babool grove. Several of the Jamūn-like leaves had been sewn together into a sort of funnel and one of the owners was observed lining it with vegetable down. Specimen No. 616 (18 April) was in juvenile plumage. No. 617 (same date) had enlarged ovarian follicles ca. 4 mm. in diameter and a prominent incubation patch, and was obviously breeding. No. 722 (25 July) had a soft skull and was undergoing post-juvenal moult, while 896 (13 August) also had an imperfectly ossified skull, but had already completed moult into fresh adult plumage.

The evidence shows that the breeding season in Travancore commences in April and probably lasts till the end of May or the middle of June. Ferguson (*J.B.N.H.S.*, xv, 456) says that it breeds in May.

Cisticola exilis erythrocephala Blyth. The Red-headed Fantail-Warbler.

Specimens not procured by the Surveys.

According to Ferguson (*J.B.N.H.S.*, xv, 456) this species is fairly common and resident on grasslands on the High Range in Travancore. Mr. Whistler has examined the following two specimens in the Trivandrum Museum collection: ♂ juv. 25-1-07, ♂ juv. 26-1-07 Devicolam. He measures them as follows:

	Bill.	Wing.	Tail.	Tarsus.
2 juv. ♂♂	12.5	45.5-48	51-53	18.5-19 mm.

In the Pālni Hills, Terry (*S.F.*, x, 476) found this warbler very common at Kukal and Kodaikanal. Fairbank (*S.F.*, v, 406) shot a ♂ on Mount Neboo (6,000 ft.) on 12 June and saw two others, while Mr. Howard Campbell also found it common in small colonies in those hills (*Fauna*, ii, 420).

No records of its breeding in Travancore or Cochin apparently exist.

Cisticola juncidis sálimalii subsp nov. The Travancore Streaked Fantail-Warbler.

Specimens collected: 79 ♀, 80 ♀ (imm.), 81 ♀ (imm.), 82 ♂ 13-1-33 Marāiyūr 3,500 ft.; 357 o?, 358 ♂ 25-2-33 Peermade 3,200 ft.; 382 ♀, 383 o? 384 ♀ 1-3-33 Kūmili 3,000 ft.; 508 ♂, 509 ♀, 510 ♂, 511 o? 5-4-33 (Velayāni Lake) Trivandrum Environs; 570 o?, 571 o?, 572 ♀ 12-4-33 Cape Comorin ca. S.L.; 623 ♂ 19-4-33 Arāmboli 250 ft.

Elsewhere noted at: Sānthanpāra (3,500 ft.); Kottāyam (ca. S.L.).

Colours of bare parts: Iris pale hazel-brown or pale olive-brown; bill, upper mandible and tip of lower pale horny-brown, commissure and rest of lower mandible pinkish flesh colour; mouth pink, brownish-pink or pale yellowish flesh-colour, in some individuals streaked or blotched with brown; legs and feet pale brownish flesh-colour; claws duskier.

[Additional specimens examined:

Trivandrum Mus. Coll.: ♂♀ 9-3-02 Trivandrum; ♂ 10-8-01, ♀ 8-8-01 Cape Comorin.

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
5 ♂♂ (summer)	10.5-11	51-55.5	33-34	19 mm.
6 ♂♂ (winter)	10.5-11	47-52.5	37-40	18.5-19 mm.
3 ♀♀ (summer)	11-11.5	45.5-48.5	33-36.5	18-19 mm.
4 ♀♀ (winter)	11-11.5	46.5-48.5	35.5-40	17-18 mm.

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At the time when I was writing the account of this species in the Eastern Ghats Survey (*J.B.N.H.S.*, xxxvi, 564) no specimens of the Streaked Fantail Warbler were available from Travancore for examination. Mr. Sálim Ali's fine series has now revealed the interesting point that this species has developed one of the peculiar dark Travancore races which we have found in so many other species. Compared with birds from North India, the Travancore series appears very 'saturated' and richly coloured, both on the upper surface and below. The rumps are bright reddish-brown and the flanks are washed with bright rufous. The small beak immediately separates the Travancore birds from the Ceylon race. I have submitted our birds to Rear-Admiral Hubert Lynes, the well-known monographer of this genus, and he agrees with the recognition of this well-marked race from the rain area. I have accordingly much pleasure in naming it after Mr. Sálim Ali in recognition of his valuable work in carrying out the Travancore Survey. The type No. 358, ♂ adult in winter plumage, 25 February 1933, Peermade 3,200 ft., has been deposited in the British Museum.—H. W.]

The Streaked Fantail Warbler is a common resident species in Travancore and found in suitable localities throughout the low country as well as up to at least 5,000 ft. in the hills. Standing paddy fields and areas under tall grass, especially on water-logged ground as on the margins of Periyār Lake and in the swampy depressions or 'valleys' among the hilltops at Wūndamet, seldom fail to attract it whilst it also frequents the grass-covered hillsides everywhere. Curiously enough I seem to have missed recording it in Cochin though there is no reason to doubt its occurrence there.

Though usually met with singly and never in flocks, it was not uncommon to find 10 or 15 birds gregariously in the same patch of grassland. They were also observed at times to alight on the ground, on bunds, etc. and hop about like Munias, presumably after insects. What were evidently courtship displays were in progress between January and March. A bird (♂ ?) launches from its perch near the tip of an upstanding grass-blade or reed, rises in the air for about 50 or 60 ft. in irregular wavering zigzags, and flies about in the same irregular undulations and wave crests in no particular direction. It closes its wings on each descending curve and flaps rapidly a few times on the upward curve. The actions are reminiscent of a Black-bellied Finch Lark. Just at the bottom, before commencing the upward curve, it utters a single '*chip*' like the snip of a barber's scissors heard in the distance. This is repeated about once every second and is also uttered from a perch at the same intervals. After flying about aimlessly in this manner for two or three minutes, the bird descends to a perch some distance away or in the same neighbourhood.

It has not been recorded from the Pālni Hills, but it is likely that some at least of Terry's notes thence (*S.F.*, x, 476) on *Cisticola c. erythrocephala* refer to this species.

In Ceylon it is represented by the race *C. j. omalura*.

Breeding: Apparently nothing is on record as regards the breeding season in this area. Of the specimens obtained by the Survey, Nos. 80 and 81 (13 January) were immature with imperfectly ossified skulls. No. 82 (same date and in the same paddy-field) had testes enlarged to 4×3 mm. and it was in worn breeding plumage. None of the others showed any gonadal development.

From his examination of the specimens, Admiral Lynes concludes that the breeding season in Travancore is probably from August until March.

Franklinia gracilis albogularis (Walden) ?. The Coorg Wren-Warbler.

Specimens collected: 195 ♂ (imm.) 30-1-23 Sānthanpāra 3,500 ft.; 241 ♀? 8-2-33 Thattākād 200 ft.; 367 ♂, 368 ♂ 27-2-33, 389 ♀ 3-3-33 Kūmili 3,000 ft.; 466 ♂ 18-3-33 Rājampāra 1,350 ft.; 649 ♂ 23-4-33, 655 ♀ 25-4-33 Balamore Estate 2,000 ft.

Elsewhere noted at: Urūmbikera Reserve Forest (near Mūndakāyam); Wadakkāncheri (400 ft.); Pādagiri (3,000 ft.—Nelliampathies).

Colours of bare parts: *Adult*: Iris straw colour; bill black, horny at chin; mouth slaty-brown and pink or pinkish-brown; legs and feet brownish flesh colour; claws horny-brown. *Immature* (No. 195): Iris orange straw;

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bill dark horny-brown, paler at commissure and gape. Mouth pale yellowish cream colour with slaty blotches; legs and feet yellowish flesh colour; claws horny-brown.

[Additional specimens examined:
Trivandrum Museum: ♂ 30-8-03, ♀ 3-8-08 Konni; o? 2-8-00, oo juvs. 27-7-00 Ponmudi.
Brit. Mus.: o? 15-3-75 Elgugand (Bourdillon).

Measurements:

	Bill.	Wing.	Summer tail.	Winter tail.
4 ♂♂	12-13	46-46.5	45-47	46 mm.
1 ♀	13	44	39	— mm.

N.B.—Nos. 195 and 367 both appear to me to be in moult from juvenile to first winter plumage so they are omitted from the measurements.

In the Eastern Ghats Report (*J.B.N.H.S.*, xxxvi, 564) I suggested that this species would probably prove to have races when better material was available. This has been confirmed though my additional material is not quite sufficient yet to allow me to work out the question fully for the whole of the range.

First of all I am definitely of the opinion that the Ceylon bird requires separation on the grounds that the summer and winter plumage are alike, both being of the type which in continental India is the breeding plumage, i.e. dark above with a grey pectoral band. The tail is the same length in both seasons and the juvenile plumage resembles that of the adults in the possession of the pectoral band. This similarity between summer and winter plumage in Ceylon is an interesting parallel with the cases of *Prinia sylvatica valida* and *P. inornata insularis* in Ceylon, already described in the Eastern Ghats Survey. The name for this race is evidently *Prinia pectoralis* Legge, *Ceylon Blue Book*, 1874, p. 9—Hambantota District, Ceylon.

The Travancore bird also requires separation. It has a definite summer and winter plumage, and the particular interest of this form lies in the fact that the pectoral band, distinct as in other continental forms in summer plumage, is also adumbrated in the winter plumage, thereby connecting the extreme difference of the continental Indian and insular Ceylon forms. The upper parts and wings are considerably darker and more saturated in winter plumage than in the winter plumage of the typical form. The upper parts may also be darker in summer plumage, but summer plumage wears and bleaches so rapidly in this species that I cannot speak positively on the point without a larger series. There is no existing name available for the Travancore race but it is possible that Coorg birds are sufficiently close to it to allow the name *Prinia albogularis* Walden, *Ann. Mag. N.H.*, 1870, vol. v, p. 219—Coorg to apply to both. The only two specimens in existence from Coorg however are two summer birds and these do not allow the point to be settled.—H. W.]

Franklin's Wren-Warbler is a common resident species in the Travancore-Cochin area, being met with by the Surveys both in the low country and in the hills up to about 5,000 ft. Ferguson (*J.B.N.H.S.*, xv, 457) states that it occurs at all elevations. It does not enter evergreen sholas but frequents the patches of tall grass, scrub and deciduous jungle on the hillsides which often alternate with them, and also similar facies in the low country. It usually keeps in small parties of 3 to 5 birds, but flocks of 10 or 12 may sometimes be seen. They are active, restless little birds for ever on the move, and in tall grass country their presence is usually proclaimed by their tinkling calls as they hop about among the stems. One seldom gets a glimpse of them unless an individual momentarily clambers up to the top or as they fly from one thicket to another. They were much more in evidence with the approach of the breeding season when males constantly clambered up on to exposed perches on bushtops or grass and uttered their 'chipping' song.

The birds were observed feeding regularly on nectar from the blossoms of *Erythrina lithosperma* shade trees in abandoned tea clearings overgrown with tall grass and bushes.

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This Wren-Warbler does not appear to have been recorded in the Pālni Hills. In Ceylon it is represented by another race, *F. g. pectoralis*, with a local distribution.

Breeding: The Surveys found that at the end of April (Ashāmbū Hills 2,000 ft.), the birds were either breeding or ready to do so. In No. 649 (23 April—fresh summer plumage) the testes had enlarged to 4×3 mm., while No. 655 (25 April also in fresh summer plumage) had a soft ovarian egg.

According to T. F. Bourdillon (*J.B.N.H.S.*, xv, 457) the breeding season in Travancore is May, June and July, the birds preferring elevations between 300 and 1,000 ft. above sea level for the purpose.

Schoenicola platyura (Jerdon). The Broad-tailed Grass-Warbler.

Specimens collected: 334 [♂] 22-2-33, 355 ♂, 356 o? 25-2-33 Peermade 3,200 ft.; 399 [♀] 5-3-33, 413 ♀ 7-3-3 Kūmili 3,000 ft.; 438 ♂, 439 ♀ 11-2-33 Camp Derāmalāi 4,000 ft.; 660 ♀, 661 ♂, 662 ♂ 25-4-33 Mūthūkūzhi, Ashāmbū Hills—3,500 ft.; 1053 ♂, 1054 ♂, 1055 ♂ 23-10-33 Peermade 3,200 ft

Elsewhere noted at: Sānthanpāra (3,500 ft.—Cardamom Hills).

Absent on *Andropogon* grass-covered hillsides between 3,000 and 4,500 ft. on the Nelliampathy Hills (16-20 December 1933) although facies apparently suitable!

Colours of bare parts: Iris brownish-grey, greyish-olive or olive brown; bill, upper mandible horny-brown, lower horny-grey or flesh colour; mouth yellowish-pink, paler in some individuals and stippled with brown in others; gape yellowish cream colour or yellow; legs, feet and claws greyish-brown.

[Additional specimens examined:

B.N.H.S. Coll.: ♂ 30-5-96 Kodaikanal (Cook).

Brit. Mus. Coll.: ♂♀ 6-4-01, ♂ 5-4-01 Muthukaly [Mūthūkūzhi ?] (Ferguson); ♂♂♀ 17-4-80 Colathoorpolay [Kulattūpūzha] Patnas 4,000 ft. (Bourdillon—Hume Coll.); ♀ 18-4-77 same locality 3,800 ft. (Bourdillon); ♂ 25-6-81 Pālnis 5,000 ft. (Fairbank); ♂ 26-4-83 Pittur, Pālnis (Terry).

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
8 ♂♂	13.5-16	64.5-69	71-73	21-23 mm.
4 ♀♀	13-14	63-64.5	63-66	21-21.5 mm.

In the *New Fauna*, ii, p. 436, Mr. Stuart Baker has given a note on the possibility of there being two races of this bird in its limited distribution on the Western Ghats from South Travancore to Belgaum. He bases the possibility on the two items of size and colour. With regard to size, he states that birds from Travancore and Ceylon measure 63 to 67 in length of wing and birds from Belgaum 66 to 71 mm. I measure the Belgaum series as follows:

	Bill.	Wing.	Tail.
5 ♂♂	14-15	70-72	65.5-72.5 mm.
2 ♀♀.	14-14.5	66.5-67	61.5-64.5 mm.

Compared with our Travancore series there is evidently no ground for separating birds from the two areas on size.

As regards colour, this point could not be settled on the British Museum series even when augmented by Mr. Sálim Ali's fine collection. The Belgaum birds were all collected in September and they are in very worn and faded dress, whereas all the Travancore birds were collected from February to April and are evidently in much fresher plumage after the complete moult which must take place in the winter. Mr. Pillai, however, very kindly made a special point of collecting three males for us in October on Peermade, so that they should be in a state of plumage comparable with the Belgaum series. These prove to be dull and faded before the approaching moult and cannot be separated from the Belgaum birds. The possibility of two races has therefore been thoroughly disposed of.—H. W.]

The Broad-tailed Grass-Warbler is common in the Travancore Hills between about 3 and 4,000 ft. Ferguson (*J.B.N.H.S.*, xv, 457) did not meet with

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it at Peermade or on the High Range, though the Survey found it not uncommon in the former locality. It frequents tall grass-covered hillsides, often steep and precipitous, and is particularly fond of the marshy or moist flat depressions among the hilltops overgrown with thin matted grass or reeds as about Wūndāmet in the Cardamom Hills and at Camp Derāmalāi. It is an inveterate skulker and all that has been written about the habits of the Streaked Grass-hopper Warbler applies to it in every detail. In patches where it occurs I found its population to be not denser than about one bird—or more rarely a pair—to an acre, and the individuals always keep widely scattered. In the mornings usually while the grass is still heavily sodden with dew, and also in the late afternoons about sunset, single birds were occasionally observed clambering up the grass stems to exposed situations near the tips and uttering a feeble '*pink, pink*', etc. somewhat similar to but louder than that of the Red Munia (*Amandava*). The flight is indirect and top-heavy like that of *Prinia* or *Cisticola*, and the broad graduated tail conspicuous on the wing.

Neither Fairbank nor Terry record this species in their Pālni lists though specimens collected by them in those hills are now in the British Museum.

In Ceylon it is believed to occur, but rarely.

Breeding: No nests appear to have been taken in Travancore. Bourdillon considered that they were breeding there in April and this presumption is partly supported by the evidence obtained by the Survey. Specimen No. 661 (25 April—fresh plumage) had testes enlarged to 6×4 mm. and in No. 662 (same date—undergoing complete moult) they measured 6×3 mm. and suggested that the birds were breeding or about to. The organs in all the 3 October specimens were enlarged to breeding condition. In Belgaum, Col. A. E. Butler and Mr. T. R. Bell took many nests in September. Is it double-brooded or is there no definite season?

Phragmaticola aëdon (Pallas). The Thick-billed Warbler.

Specimens collected: 68 ♀ 12-1-33 Marāiyūr 3,500 ft.; 154 ♀ 25-1-33 Sānthanpāra 3,500 ft.; 225 ♀ 6-2-33, 252 ♀ 9-2-33 Thattākād 200 ft.; 450 ♀ 17-3-33, 460 ♂ 18-3-33 Rājampāra 1,350 ft.; 967 ♂ 12-12-33 Pādagiri 3,000 ft.

Elsewhere not noted.

Colours of bare parts: Iris hazel-brown to olive-brown; upper mandible horny-brown, lower yellowish flesh colour; gape and mouth bright orange yellow; legs and feet plumbeous; claws horny-brown.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
3 ♂♂	19.5-21	84.5-86	88-90.5	27-29 mm.
5 ♀♀	18-20.5	78.5-84	83-87	26-29 mm.

All the Survey specimens are of the fulvous-brown type of colouration.—H. W.]

Ferguson says (*J.B.N.H.S.*, xv, 457) that in Travancore 'it is a very occasional winter visitor. I have only one specimen shot at the foot of the hills'. In view of this statement it is interesting to record that the Surveys found this species fairly common between 12 December and 18 March in suitable localities, at elevations from 200 up to 3,500 ft. in both Travancore and Cochin. Its favourite haunts are the patches of tall grass and weeds that so luxuriantly overrun abandoned forest clearings, and the growth of grass tussocks and bracken bushes on water-logged ground in ravines etc. through tea and coffee plantations.

As it hops about the undergrowth it utters a loud, harsh quick-repeated '*tschuck, tschuck*' and '*chr-r*' etc., the latter like the agitated notes of the Black-headed Babbler (*Rhopocichla*), but louder. These calls are sufficiently distinctive, with a little practice, to proclaim its identity long before a glimpse of their skulking producer can be obtained.

It has not been recorded from the Pālni Hills or from Ceylon.

Hippolais rama rama (Sykes). Sykes' Tree-Warbler.

Specimen collected: 543 ♀ 8-4-33 Cape Comorin ca. S.L.

Elsewhere not noted: Possibly confused with *Acrocephalus dumetorum*.

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Colours of bare parts: Iris olive-brown; fine rim round eye (eyelids) magenta; upper mandible horny-brown, lower pinkish flesh colour; mouth orange-yellow; legs, feet and claws brownish flesh colour.

This species is apparently a fairly common winter visitor to Southern India but I do not record sight observations as it is not easy to differentiate it with certainty in the field from the commoner *Acrocephalus dumetorum*, while the habits and call notes of the two are also practically indistinguishable. The specimen was in fresh plumage and very fat, suggesting that it was ready to emigrate.

Curiously enough the only other example recorded from Travancore (*J.B.N.H.S.*, xv, 457) was also obtained at Cape Comorin (December 1901).

Phylloscopus affinis (Tickell). Tickell's Willow-Warbler.

Not procured or noted by the Surveys, but Ferguson (*J.B.N.H.S.*, xv, 457) records specimens obtained during the winter months from the High Range of Travancore at 6,000 ft. elevation—never in the plains.

In the Pālni Hills it is apparently common at Pulungi and one collected by Fairbank on 3 April is now in the British Museum. It does not seem to migrate as far south as Ceylon.

[Phylloscopus inornatus humei (Brooks). Hume's Willow-Warbler.

Not procured by the Surveys, neither is it mentioned in Ferguson's Travancore list nor in those of Fairbank and Terry for the Pālni Hills. On what authority it is stated in the *Fauna* (ii, 469) to extend in winter as far south as Travancore is not known.]

Phylloscopus nitidus nitidus Blyth. The Green Willow-Warbler.

Specimens collected: 25 ♂ 7-1-33, 94 ♂ 14-1-33 Marāiyūr 3,500 ft.; 235 ♀ 7-2-33, 244 o? 8-2-33 Thattākād 200 ft.; 447 ♂ 16-3-33 Rājampāra 1,350 ft.; 920 ♂ 29-11-33 Wadakkāncheri 400 ft.; 1019 o? 26-12-33 Karūpadanna ca. S.L.

[There is a specimen with no data from Mynall in the British Museum by Bourdillon.

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂	12-13.5	63-67	48-49.5	19-19.5 mm.
1 ♀	13	62.5	48	18 mm.—H. W.]

Phylloscopus nitidus viridanus Blyth. The Greenish Willow-Warbler.

Specimens collected: 119 ♂ 20-1-33 Mūnnār 5,000 ft.; 365 ♀ 27-2-33 Kūmili 3,000 ft.

[Measurements:

	Bill.	Wing.	Tail.
1 ♂	14	64	48 mm.
1 ♀	13	58	— mm.—H. W.]

Elsewhere noted at: Kottāyam (ca. S.L.); Peermade (3,200 ft.); Tenmalāi (500 ft.); Chālakūdi; Kūriārkūtti (1,600 ft.); Nemmāra (300 ft.); Pādagiri (3,000 ft.).

Colours of bare parts: Iris brown; bill, upper mandible and tip of lower horny-brown, commissure and rest of lower mandible pale flesh colour; mouth pale yellow and greyish-pink, or yellow; in some individuals gape also yellow; legs and feet greenish-grey or pale horny-brown; soles yellowish.

I treat these two forms together as I am totally unable to distinguish them in the field. The call-notes of the Willow-Warblers once ascertained by properly authenticated specimens, appear to me to be the most satisfactory guide to distinguishing many of the confusing species in life, but in the case of these two they are so similar that this method fails.

Both the Green and the Greenish Willow-Warblers are common winter visitors to Travancore and Cochin, the low country as well as to at least 5,000 ft. up in the hills. The latest record I have is 27 March by which date the majority of birds had certainly departed. Ferguson (*J.B.N.H.S.*,

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xv, 458) shot two specimens as late as July and suggests that some may remain through the summer.

They are usually met singly hopping about amongst undergrowth and the foliage of trees both in deciduous and, to a lesser extent, in evergreen jungle, uttering a merry, penetrating '*chi-wee*' at intervals of a few seconds. The Surveys also found them invariably present among the fruit gardens about backwater homesteads and in wooded compounds of the larger towns.

They have apparently not been recorded from the Pālni Hills where they must doubtless occur. Both forms are also winter visitors to Ceylon, the latter having occurred in the island in March.

Phylloscopus magnirostris Blyth. The Large-billed Willow-Warbler.

Specimens collected: 165 ♂ 26-1-33 Sānthanpāra 3,500 ft.; 328 ♀ 22-2-33 Peermade 3,200 ft.; 862 o? 14-11-33 Kūriārkūtti 1,600 ft.

Elsewhere noted at: Kūmili (3,000 ft.—Periyār Lake Environs); Kūvalle Incline (Cochin Forest Tramway); Chālakūdi; Wadakkāncheri (400 ft.); Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris hazel brown; bill horny-brown, pale flesh colour at gape, chin, commissure and tip of lower mandible; mouth pale pinkish-yellow; legs, feet and claws greyish-brown or brownish-slate.

[Additional specimen seen:
Brit. Mus. Coll.: ♀ 15-11-74 Mynall (Bourdillon).

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	15	73	54	19 mm.
1 ♀	14.5	62.5	47.5	18.5 mm.—H. W.]

The Large-billed Willow-Warbler is also a common winter visitor to this area, the latest date I have being 7 March. In my experience it is far more partial to evergreen forest than the two foregoing, and commoner than either the Green or the Greenish Willow-Warbler in the sholas (up to 4,000 ft. !). William Davison (*Ibis* 1883, pp. 146-7) also found it very common 'in the Travancore Hills'. In the short time he was there he collected 19 specimens and says he could easily have got 50 more.

The call-note is a mousy, interrogative '*whee-chi*?', besides which a short feeble song was occasionally heard.

It has not been recorded from the Pālni Hills. In Ceylon it is a winter visitor.

Phylloscopus occipitalis occipitalis (Blyth). The Large Crowned Willow-Warbler.

Specimens collected: 124 ♂ 22-1-33 Sānthanpāra 3,500 ft.; 372 o? 28-2-33 Kūmili 3,000 ft.; 430 ♀ 9-3-33 Camp Derāmalāi 3,000 ft.; 981 ♂ 15-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Thattākād (200 ft.).

Colours of bare parts: Iris brown; bill, culmen brown, commissure, tip and lower mandible pale orange-yellow; mouth pale yellow; legs, feet and claws greyish-brown or brownish-slate; soles pale yellow.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
2 ♂♂	13-13.5	66-68	54	17 mm.
1 ♀	13.5	61	45	19 mm.—H. W.]

A common winter visitor to Travancore and Cochin. Last noted 9 March. This Warbler is confined to evergreen forest mostly on the hills between 3 und 4,000 ft. elevation, but it also occurs in this biotope in the low country. Unlike the preceding 3 species, it is gregarious in its habits and moves about in active flocks of from 10 to 30 birds amongst the foliage of lofty trees in sholas, searching the sprigs for insects. They were invariably found in association with other small birds such as *Culicicapa*, *Zosterops*, *Machlolophus*, *Muscicapula pallipes* and *Alcippe poioicephala*.

It has not been recorded from the Pālni Hills or from Ceylon.

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Prinia socialis socialis Sykes. The Ashy Wren-Warbler.

Specimens collected: 147 ♂ 24-1-33 Sānthanpāra 3,500 ft.; 351 ♂ 24-2-33 Peermade 3,200 ft.; 407 ♂ 5-3-33, 416 ♂ 7-3-33 Kūmili 3,000 ft.; 431 ♀ 10-3-33 Camp Derāmalāi 3,000 ft.

Elsewhere noted at: Rājampāra (1,350 ft.); Balamore Estate (2,000 ft.—Ashāmbū Hills).

Noted as absent in Cochin at the following places: Kūriārkūtti (1,600 ft.); Wadakkāncheri (400 ft.); Nemmāra (300 ft.); Pādagiri (3,000 ft.); Trichūr.

[Additional specimen examined:
Trivandrum Museum Coll.: o? 2-1-04 Arnakal.

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂	14	48-50.5	60-65	20-20.5 mm.
1 ♀	14.5	46	55	— mm.

All specimens in winter plumage.—H. W.]

The Ashy Wren-Warbler is a resident species in Travancore, not uncommon where it occurs, but curiously patchy in its distribution. During the whole of the Cochin Survey it was noted as 'absent'. It frequents tall grassland on the hillsides (between 1,500 and 3,500 ft. !) and was not observed in the low country at all though Ferguson states (*J.B.N.H.S.*, xv, 458) that it is found in suitable localities there. At Wūndāmet in the Cardamom Hills (ca. 3,000 ft.) it was common among the matted grass and reed-beds in the water-logged hollows or 'valleys' where the birds appeared to have concentrated owing to the burning of the grass on the surrounding hilltops.

Fairbank (*S.F.*, v, 406) obtained a specimen on a grassy hillside at 6,000 ft. in the Pālni Hills, but he does not say anything about its numbers there. Terry says (*S.F.*, x, 476) that it is not uncommon on the slopes in the long grass near Pulungi and Pittur. It is represented in Ceylon by the slightly smaller and shorter tailed race *P. s. brevicauda* Legge.

Breeding: The gonads of all the Survey specimens were in normal non-breeding condition. According to T. F. Bourdillon (*J.B.N.H.S.*, xv, 458) this Wren-Warbler 'breeds [in Travancore] most abundantly on the lower slopes of the hills in May and June and also in July'.

Prinia sylvatica sylvatica Jerdon. The Jungle Wren-Warbler.

Specimens collected: 627 ♂ 19-4-33, 630 ♂ 20-4-33, 639 ♂, 640 ♀ 21-4-33 Arāmboli 250 ft.

Elsewhere not noted.

Colours of bare parts: Iris bright brownish-yellow or orange-brown; rim round eye (eyelids) paler; bill blackish-brown, paler at chin and on gonys; mouth brownish-slate or pink with brownish streaks; legs and feet brownish flesh colour; claws horny-brown.

[No other specimens seen.
Measurements:

	Bill.	Wing.	Tail.	Tarsus.
3 ♂♂	14.5-16.5	61-62	67-67.5	22-23.5 mm.
1 ♀	14	53.5	57.5	— mm.

All in winter plumage. These are the first specimens I have seen from Travancore and they agree definitely with the typical form and not the Ceylon race.—H. W.]

The Jungle Wren-Warbler has apparently not been recorded from Travancore before. The Survey met with it only at Arāmboli at the southern end of the Ashāmbū Hills and on the western extremity of the gap or pass through the Ghats leading into the drier district of Tinnevelly (Madras Presidency). It frequented steep boulder-strewn hillsides with sparse cactus and thorn bushes where males were constantly observed perching on the boulders or in exposed positions on bushes and warbling '*Pretty-pretty*', etc. reminiscent of a Tailor-bird's call, but louder and easily distinguishable from it. It

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was repeated for three minutes or more at a stretch and resumed after a pause of two or three seconds. Each '*pretty*' of the song is preceded by a curious subdued ventriloquistic '*pit*' uttered in a different key. The birds were extremely wary and difficult to approach. Their absence from the rest of Travancore and from Cochin suggests that their habitat is confined to broken, boulder-covered hills with sparse and stunted vegetation, a facies which does not occur elsewhere within the area.

It has not been recorded in the Pālni Hills. The race *P. s. valida* represents it in Ceylon.

Breeding: From the excited behaviour of the birds at the time (middle to end April) it was evident that they were nesting. No. 627 (19 April) had testes enlarged to 6×4 mm. and on the same date another bird was observed carrying building material. In No. 639 (21 April) the testes measured 5×4 mm. Its pair, 640, had probably finished laying but there was a conspicuous incubation patch present. From the agitated behaviour of this pair—hopping about the bushes and uttering '*pit-pit-pit-pit*', etc.—it was clear that they had a nest (or young ?) in the neighbourhood.

Prinia inornata franklinii Blyth. The South Indian or Nilgiri Wren-Warbler.

Specimens collected: 194 ♀ (imm.) 30-1-33 Sānthanpāra 3,500 ft.; 241 o?, 242 ♂ 8-2-33, 276 ♀ (imm.) 12-2-33 Thattākād 200 ft.; 284 o?, 285 ♀ 15-2-33 Kottāyam ca. S.L.; 389 ♀ 3-3-33 Kūmili 3,000 ft., 434 ♀ 10-3-33 Camp Derāmalāi 3,000 ft.; 1005 ♂ 25-12-33, 1016 ♂ 26-12-33, 1050 ♀, 1051 ♂ 31-12-33 Karūpadanna ca. S.L.

Elsewhere noted at: Peermade (3-4,000 ft.); Wadakkāncheri (400 ft.—only 1 in a paddy-field; unconfirmed !); Nemmāra (300 ft.—very scarce).

Colours of bare parts: *Adult*: Iris and eyelids brownish-yellow or orange-straw colour; bill, upper mandible and tip of lower horny-brown, rest of lower mandible pale flesh colour; mouth blackish-brown, brownish flesh colour or pale pink with brownish streaks and blotches (probably seasonal); legs and feet brownish flesh colour; claws dusky. *Immature*: Iris pale khaki; gape and eyelids yellow; mouth pinkish-yellow; legs and feet as in adult but with a pinkish flush.

[Measurements:

	Bill.	Wing.	Summer tail.	Winter tail.
4 ♂♂	13.5	47-50.5	53-55.5	— mm.
2 ♀♀	12.5-13	48.5-49	50.5-51	— mm.
3 ♀♀	12.5-13.5	46-49	—	57.5-63 mm.

Nos. 241, 242, 284, 285, 1005, 1016, 1050 and 1051 are all in breeding plumage which is evidently assumed by a complete pre-nuptial moult about December. Nos. 194, 276, 389 and 434 are either birds in juvenile plumage or in their first winter plumage, evidently agreeing with the adult winter plumage in colour and greater length of tail. The series has therefore satisfactorily cleared up the point—shown in the Eastern Ghats Survey, *J.B.N.H.S.*, xxxvi, 577, as obscure—that in this race the relationship between the summer and winter plumages[1] is in line with that of the other continental forms and not as in the Ceylon race. These plumages are much darker and browner than in the typical race with the tail markings more distinct. The difference between them of course accounts for Ferguson's belief that two forms of this Wren-Warbler were to be found in Travancore.—H. W.]

This Wren-Warbler is common among the grassy bunds and paddy-fields about the backwaters both in Travancore and Cochin, and is also found to a lesser extent in undulating grassland in deciduous country and on the hills in similar facies up to at least 4,000 ft. elevation. Ferguson (*J.B.N.H.S.*, xv, 459) found it up to 6,000 ft. (''*P. jerdoni*''). I did not come across it in the Nelliampathy Hills at all. Its distribution is patchy and capricious, the birds being absent from many areas to all appearances eminently suited to them.

In the Pālni Hills, Fairbank (*S.F.*, v, 406) observed it chiefly above 5,000 ft. elevation in long grass and fern thickets. In Ceylon it is represented by the race *P. i. insularis* (Legge).

[1] Or more intelligibly in Travancore 'breeding and non-breeding plumages.'

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Breeding: The earliest date on which nesting activity was noted was 8 December (Nemmāra) when a bird was observed carrying building material —a strip of paddy leaf. No. 1016 (26 December) had its testes enlarged to 6×4 mm. and it was undergoing complete pre-nuptial moult. Nos. 194 (30 January) and 276 (12 February) were immature with imperfectly ossified skulls and evidently lately out of nest. In 285 (15 February) the ovarian follicles measured 1-1.5 mm. At this time males were warbling excitedly from exposed perches on grass or paddy stems and chasing each other about. An individual was observed carrying a green caterpillar in its bill and from all these signs it was obvious that breeding was in progress.

From the evidence obtained, the breeding season in Travancore-Cochin appears to be earlier than that given for the Nilgiris (March to July), but how long it continues here is not known. The two specimens obtained on the hills in March had undeveloped gonads.

Family: Irenidæ.

Irena puella puella (Latham). The Fairy Blue-bird.

Specimens collected: 28 ♂, 29 ♀ 7-1-33 Marāiyūr 3,500 ft.; 462 ♂ 18-3-33 Rājampāra 1,350 ft.; 971 ♂ 12-12-33, 975 (not sexed—alcohol sp.) 13-12-33, 979 (not sexed—alcohol sp.) 14-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Sānthanpāra (3,500 ft.); Thattākād (200 ft.); Ūrūmbikera Reserve Forest (ca. 1,000 ft.—near Mūndakāyam); Peermade (3,200 ft.); Kūmili (3,000 ft.—Periyār Lake Environs); Tenmalāi (500 ft.); Balamore Estate (2,000 ft.—Ashāmbū Hills); Kūvalle Incline (Cochin Forest Tramway); Kūriārkūtti (1,600 ft.).

Colours of bare parts: Iris claret or scarlet; bill in ♂ black, in ♀ brownish-black; mouth greyish-pink; legs, feet and claws black.

[Additional specimens examined:

Brit. Mus. Coll.: Ad. ♂♂ 12-12-78, 24-7-78, 20-11-74, 11-11-78 and -10-78; ♀♀ 5-12-78, 29-11-78 Mynall (Bourdillon).

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
9 ad. ♂♂	27.5-30	124.5-134	100-106	18-18.5 mm.
3 ♀♀	27-30	127-127.5	101.5-104	17.5 mm.

The juvenile plumage is a dull edition of that of the adult female except that the wings and their coverts have very little of the blue-green wash and the lower parts are dull sooty-black with only a few feathers blue-green. The first primary is softer and rather more rounded than in the adult while the tail feathers are narrower. The first winter male resembles the adult female still more closely, but I have not seen enough material to work out the moults.—H. W.]

The Fairy Blue-bird is a resident of evergreen forest and is found in Travancore and Cochin wherever this biotope occurs both in the low or foot-hills country (cf. Thattākād) and up in the highest sholas. Parties of 7 or 8 birds are commonly met with flying about among the lofty tree-tops uttering a pleasant musical '*weet-weet*' as they do so. They also occasionally descend into low bushes to feed on various berries. They are very fond of the various species of *Ficus* figs, and flowers of *Erythrina lithosperma* shade trees in coffee estates are regularly visited for the nectar. Two of the specimens shot off these had pollen adhering to their chin feathers. The call-note most usually heard is a rich, mellow, percussive '*Whats it*' repeated every few seconds.

Fairbank (*S.F.*, v, 406) records this species as common in the Pālni Hills from their base up to 4,500 ft. In Ceylon it is probably only a straggler.

Breeding: The birds were evidently breeding in March. Specimen No. 462 (18 March) had its testes enlarged to 11×7 mm.; it was in fresh plumage and was observed tugging at dry twigs for a nest.

According to T. F. Bourdillon (*J.B.N.H.S.*, xv, 262) it builds in Travancore at elevations between 500 and 3,000 ft. above sea level from January to May. Kinloch took eggs in the Nelliampathy Hills on 26 February, and

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Stewart in Travancore in every month from January to June. Most eggs are said to be found in March and April. The normal clutch is almost invariably 2 eggs, but c/3 has once been taken and one incubated egg is occasionally found (*Nidification*, ii, 497).

Family: Oriolidæ.

Oriolus oriolus kundoo Sykes. The Indian Oriole.

Specimens collected: 269 ♂ 11-2-33 Thattākād 200 ft.; 486 ♀ 24-3-33 Tenmalāi 500 ft.

Elsewhere noted at: Sānthanpāra (3,500 ft.); Kottāyam (ca. S.L.); Kūmili (3,000 ft.); Kūriārkūtti (1,600 ft.); Wadakkāncheri (400 ft.); Nemmāra (300 ft.); Pādagiri (3,000 ft.—Nelliampathies); Trichūr Town; Karūpadanna (ca. S.L.).

Colours of bare parts: Iris brownish-scarlet; bill reddish-brown; mouth pinkish flesh; legs and feet slate; claws horny-brown.

[Other specimens examined:

Brit. Mus. Coll.: ♀ 13-11-78 Trivandrum; ♀ 11-3-77, ♀ 20-12-78 Mynall (Bourdillon).

In the *Ibis* 1916, pp. 56-7, Dr. C. B. Ticehurst made some notes on the plumages of a series of orioles collected by me in Jhelum District, Punjab. That account is now expanded after the examination of a considerable amount of fresh material.

In juvenile plumage (presumably of both sexes), the crown, ear coverts and hind-neck are yellowish-green with an indistinct dusky loral band; upper parts olive-green with pale tips to the feathers; upper tail coverts bright yellow; wings dark brown, all the lesser and median coverts and the tertiaries washed with olive-green and with pale tips; primary coverts dark brown, the ends of the feathers with well-defined yellow edges; primaries and secondaries dark brown, edged with greyish-white; tail olive-green all but the central pair of feathers with bright yellow tips to their inner webs, broadest towards the outer feathers. The underparts are white, washed with pale yellow on the flanks, all the feathers with dark brown shaft streaks except on the chin and throat; undertail coverts bright yellow.

The post-juvenal moult takes place about August. The male in first winter plumage has the whole of the upper plumage and sides of the head except for an indistinct dusky loral band, greenish-yellow, brightest on the supercilium and rump and dullest on the wing coverts; the primaries and secondaries, the primary, median, and greater wing coverts and the tail are retained from the juvenile plumage. Lower plumage greyish-white, the sides of the breast, the flanks and the undertail coverts golden yellow, the breast and flanks having broad blackish-brown shaft streaks.

The male in second winter plumage is very similar but the loral streak is darker and better defined and there is more yellow on the lower plumage. This stage may however be easily recognised by the primary coverts which have their yellow tips much wider and yellower, forming a distinct yellow patch, while the lesser wing coverts are irregularly blotched with brownish-black.

Third winter males are still brighter and yellower on the upper parts; the lower plumage is bright orange-yellow throughout, almost but not quite as clear as in the adult, and the shaft streaks are narrow, indistinct and sometimes absent. The wings now resemble those of the adult being black with a yellow patch on the primary coverts and distinct yellow tips to most of the primaries and secondaries. The lesser and median coverts, the tertiaries and to a lesser extent the secondaries are still, however, much washed with olive-green while the yellow patch on the primary coverts is neither so large nor so pure as in the adult. The tail in this stage is also distinctive; the central pair of feathers is olive-green with black tips and a terminal yellow triangular spot, the amount of yellow in the other feathers being greater than in the last stage.

Finally the adult male plumage—as described in all text-books—is assumed at the fourth autumn. The brown iris of the juvenile has become red by the first summer, the males breeding in their first year in spite of the much longer period necessary for the assumption of full plumage.

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The first winter female only differs from the first winter male in having the under plumage whiter, lacking most of the yellow wash on the breast and flanks.

In second winter plumage she appears to be quite indistinguishable from the male of a similar age, while the adult plumage—of the text-books—is assumed in the third winter, that is at the post-nuptial moult at the end of the second breeding season.

The autumn moult is always complete except in the case of the first, viz. the post-juvenal moult when the wings and tail are retained from the juvenile plumage as mentioned above. There appears to be no spring moult.

It is not quite clear to me whether some females attain a plumage similar to that of the adult male. I have seen birds, which on plumage could certainly not be distinguished from adult males, marked as females but there was nothing to show whether the sexing was reliable.[1] There is, however, one adult female in the Scully Nepal Collection in the British Museum which differs from the adult male only in having the central pair of tail feathers green with black tips. This is reliably sexed as there is a drawing of the enlarged ovary on the label.—H. W.]

The Indian Oriole is, as Ferguson observes (*J.B.N.H.S.*, xv, 461) sparingly met with in the low country of Travancore and also in the hills, in my experience up to about 3,500 ft. elevation. According to him it is a resident species. The Survey noted it as most abundant at camps between 25 January and the end of March. By about the middle of April it was not in evidence at all and it seems more than probable that the majority of birds had left. Kinloch (*J.B.N.H.S.*, xxvii, 941) describes it as 'very common' in the Nelliampathy Hills at what season he does not say, and its status there is presumably the same as in Travancore. The Cochin Survey found it only moderately common at Pādagiri in December.

This Oriole frequents open secondary forest either deciduous or with a mixture of evergreen species, well-wooded compounds and groves of trees about cultivation, and is often met with in the localised bird associations. It was observed feeding largely on Peepal figs (*Ficus religiosa*), Lantana berries and on the nectar of *Erythrina lithosperma* blossoms.

It has apparently not been recorded in the Pālni Hills or in Ceylon.

Breeding: The gonads of the specimens were in a quiescent state and no record of its breeding in Travancore or Cochin exists.

Oriolus chinensis diffusus Sharpe. The Indian Black-naped Oriole.

Specimen collected: No. 451 ♀ (imm.) 17-3-33 Rājampāra 1,350 ft.
Elsewhere noted at: Thattākād (200 ft.).
Colours of bare parts: Iris brown, rest as in *kundoo*.

[Measurements:

Bill.	Wing.	Tail.
33	149	93.5 mm.—H. W.]

This oriole was observed singly in small numbers in secondary mixed deciduous-and-evergreen jungle on the edge of rubber plantations. One was feeding on 'Omé' berries (*Trema orientalis* Blume).

Ferguson (*J.B.N.H.S.*, xv, 461) describes it as an occasional winter visitor to the low country in Travancore and says that he has only one specimen obtained in Trivandrum. Mr. Whistler has examined five further Travancore specimens in the British Museum (Fry, Bourdillon, Anjango) with no more precise data.

It is a straggler in winter to Ceylon.

Oriolus xanthornus maderaspatensis Franklin. The South Indian Black-headed Oriole.

Specimens collected: 690 ♀ imm. 18-7-33 (Pūlayanārkotta 200 ft.); 745 ♂

[1] I agree with this as I have watched several breeding pairs of adults during the last two seasons (Dehra Dun) in which the male could not be distinguished from the female by colour.—S. A.

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imm. 29-7-33 (Kūttāni 300 ft.); 832 ♂ ad. 11-8-33 (Pūlayanārkotta 200 ft.) Trivandrum Tālūk.

Elsewhere noted at: Marāiyūr (3,000 ft.); Thattākād (200 ft.); Kottāyam (ca. S.L.); Tenmalāi (500 ft.); Trivandrum Town (ca. S.L.); Wadakkāncheri (400 ft.); Nemmāra (300 ft.); Karūpadanna (ca. S.L.).

Colours of bare parts: *Adult*: 'Iris crimson; bill horny pinkish-brown, darker at tip; mouth pale greyish-pink; legs and feet bluish; claws horny-black' (Pillai). *Immature* (Nos. 690 and 745): 'Iris blackish-grey and light blue [?]; bill slaty-black; mouth grey and pink; legs and feet blackish-grey (690), bluish-grey (745); claws horny-brown' (Pillai).

[Additional specimens examined:

Brit. Mus. Coll.: ♂ 19-11-70 Trivandrum (Bourdillon), ♂ undated Trivandrum (Fry), ♂ 8-5-77 Lower Pālnis (Fairbank).

Measurements:

	Bill.	Wing.	Tail.
3 ad. ♂♂	29-32	132.5-139.5	83-86.5 mm.
1 imm. ♂	29	133.5	86 mm.
1 imm. ♀	26	126.5	79 mm.—H. W.]

The Black-headed Oriole is a common resident species in Travancore and Cochin. It is found in the low country, usually under 500 ft. elevation, and excepting Marāiyūr (3,000 ft.)—where it was fairly common in open deciduous forest about the terraced paddy-fields in the valley—it was not met with at all in the hills. Kinloch (*J.B.N.H.S.*, xxvii, 940) also states that it does not occur in the Nelliampathy Hills at any season. In the Pālni Hills, however, Fairbank (*S.F.*, v, 406) met with it from the base up to 5,000 ft. I hazard a guess that Fairbank's statement refers only to the eastern and drier side of the hills where the facies is of a nature more suited to this species.

In Ceylon it is represented by the endemic race *O. x. ceylonensis* Bonaparte.

Breeding: There are no published records of the breeding of the Black-headed Oriole in the Travancore-Cochin area. Two of the specimens obtained by Mr. Pillai at the middle and end of July, however, were immature with —according to the collector—imperfectly ossified skulls. Both of these are in fresh first winter plumage.

Over the greater part of its range, it breeds from February to July—principally April and May (*Fauna*, iii, 12). The Ceylon race, according to Wait breeds in the island from October to May (*Nidification*, iii).

Family: Eulabetidæ.

Gracula religiosa indica (Cuvier). The Southern Grackle.

Specimens collected: 427 ♂ 9-3-33 Camp Derāmalāi 3,000 ft.; 500 ♂ 27-3-33 Tenmalāi 500 ft.

Elsewhere noted at: Mūnnār (5,000 ft.—Kanan Devan Hills); Sānthanpāra (3,500 ft.—Cardamom Hills); Thattākād (200 ft.); Ūrūmbikera Reserved Forest (ca. 1,000 ft.—near Mūndakāyam); Peermade (3,200 ft.); Kūmili (3,000 ft.—Cardamom Hills); Rājampāra (1,350 ft.—Panthalam Hills); Balamore Estate (2,000 ft.—Ashāmbū Hills); Kūriārkūtti (1,600 ft.—Annemalāi Hills); Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris brown; bill orange with yellow tip; mouth, palate yellow, gullet pink; wattles and infra-orbital skin bright yellow; legs and feet orange-yellow; claws blackish-brown.

[Additional specimens seen: 3 from Lower Pālnis (Fairbank).

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
2 ♂♂	29-30	142.5-149	66-67	29-31 mm.

This race also occurs in Ceylon where its exact relationship with the Ceylon Grackle (*Gracula ptilogenys*) is not very clear. Both are birds of very local distribution in the island and in the main their ranges do not appear to coincide. This latter form is usually attributed to a distinct species because of the suppression of the wattle on the ear coverts though a

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division in the feathers suggests its comparativley recent suppression. As, however, the variation in the wattles is a subspecific character elsewhere and the ranges of the two birds in Ceylon have possibly been confused by the process of deforestation, it appears probable that *ptilogenys* is in reality nothing more than a race of *religiosa*.—H. W.]

The Grackle or Hill Myna is one of the commonest birds on the forested hills of Travancore and Cochin. The Survey has noted it in evergreen forest as low down as Thattākād (200 ft.) and it also occurs in the forest-clad foothills, but most abundantly at between about 1 and 4 thousand ft. elevation, and in lesser numbers up to at least 5,000 ft. It is partial to the lofty shade trees in cardamom plantations feeding on the ripe fruit of *Calophyllum wightianum* (?) and of the various species of *Ficus* scattered about these sholas, in company with hornbills, barbets, green pigeons and other frugivorous birds. Flocks of up to 20 or more birds are commonly met with. Their wings produce the same whirring sound as green pigeons' and some of their loud, sharp call-notes may easily be mistaken for those of the Black Bulbul (*Microscelis*). They also feed largely on nectar from the flowers of *Bombax malabaricum* in forest, and *Grevillea robusta* and *Erythrina lithosperma* shade trees in tea and coffee plantations. I have frequently observed pollen adhering to their chin and forehead feathers and have no doubt that they assist considerably in the cross-pollination of these species.

One bird of a pair noted at Rājampāra (16 March) had the abdomen and vent white; its mate was normally coloured.

In the Pālni Hills this Grackle is common up to 4 or 5,000 ft.

Breeding: No. 427 (9 March) had testes enlarged to 8×4 mm. and a conspicuous incubation patch, and was one of a pair. In No. 500 (27 March) the testes measured 8×5 mm. and it also had a prominent incubation patch. On 4 March a pair were observed carrying fine twigs into a hole in a dead tree-trunk standing in the Periyār Lake at a height of about 25 ft. from the surface of the water. On 20 March another pair was observed building in a hollow in a dead tree-trunk on the edge of Lahāi Rubber Estate (Rājampāra) about 40 ft. up. By this time birds were mostly in pairs when not congregated to feed, and breeding was obviously in progress generally.

According to Stewart (*Nidification*, ii, 506) the breeding season in Travancore is February to April—earliest date for eggs 6 February, latest 28 April. He says that in July some birds seem to breed again as he has taken fresh eggs on the 28th of that month. Bourdillon took a nest on 27 May. The full clutch consists of 3 eggs, but sometimes only two are laid.

Family: Sturnidæ.

Pastor roseus (Linn.). The Rosy Pastor or Rose-coloured Starling.

Specimens collected: 354 ♂ 25-2-33 Peermade 3,200 ft.; 603 ♀, 604 ♂ 16-4-33 Arāmboli 250 ft.; 953 ♂ 7-12-33 Nemmāra 300 ft.

Elsewhere noted at: Thattākād (200 ft.); Kūmili (3,000 ft.).

Colours of bare parts: Iris hazel brown; upper mandible and tip of lower mandible horny-brown, gape and rest of lower mandible pale yellow; mouth, palate yellow, gullet pink; legs, feet and claws horny-brown.

[No other Travancore specimens seen.—H. W.]

Ferguson writes (*J.B.N.H.S.*, xv, 462): 'Found in large flocks both in the low country and on the hills from September to April usually. I have seen them as late as May occasionally.' This conveys the impression that the bird is a common winter visitor, but my experience both in Travancore and Cochin shows that it is decidedly rare and uncommon in these parts. The largest flock noted by the Travancore Survey comprised of about 10 birds; parties of 3 or 4 or single individuals amongst flocks of Grey-headed and Brahminy Mynas was more usual. The two seasons during which these areas were worked did not appear to be exceptional in any way, and therefore my experience and Ferguson's statement seem rather difficult to reconcile. The explanation doubtless is, however, that as in other parts of its winter as well as breeding range its numbers vary considerably from year to year

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depending partly upon the abundance or otherwise of food supply, but partly also on factors which as yet we do not know.

The specimens shot or observed were feeding largely on the berries of *Lantana camara* and *Salvadora persica* and also on the nectar of *Bombax* flowers. The stomach of No. 953 (7 December) was crammed full of ripe Lantana berries exclusively. 56 seeds were recovered from the guts intact, some of which were on the point of being excreted. As I have noted elsewhere, the Pastor is undoubtedly one of the more important agents in the dispersal of this pernicious weed in India.

This bird has apparently not been recorded in the Pālni Hills. It is an irregular and uncertain winter visitor to Ceylon in small numbers.

Sturnia malabarica malabarica (Gmelin). The Grey-headed Myna.

Specimens collected: 41 ♀ 9-1-33, 97 ♂ 15-1-33 Marāiyūr 3,500 ft.; 545 ♂ 9-4-33 Cape Comorin ca. S.L.; 928 ♀ 1-12-33 Wadakkāncheri 400 ft.

Sturnia malabarica blythii (Jerdon). Blyth's Myna.

Specimens collected: 255 ♂ 9-2-33 Thattākād 200 ft.; 453 ♂ 17-3-33 Rājampāra 1,350 ft.; 762 ♂ imm. 31-7-33 (Mārūthānkūzhi 50 ft.); 821 ♂ imm. 9-8-33 (Nettāyam 200 ft.) Trivandrum Taluk.

Elsewhere noted (both forms) at: Kottāyam (ca. S.L.); Kūmili and Periyār Lake Environs (3,000 ft.); Balamore Estate (2,000 ft.—Ashāmbū Hills); Kūriārkūtti (1,600 ft.).

Colours of bare parts: Iris greyish- or creamy-white; bill yellow at tip, leaden blue at base with a greenish intervening area. In immature birds (Nos. 762 and 821) the green is replaced by brown; mouth, palate dusky yellow, gullet pinkish-grey or slaty; legs, feet and claws yellowish-brown, brownish-flesh or pale lemon yellow.

[Additional specimens seen:

B.N.H.S. Coll.: *malabarica* o? n.d. Thekadi, Travancore (Cook); ♀ 3-2-29 Kalathrupoli, Travancore (M. O. H. Beusley).

Brit. Mus. Coll.: *blythii* o? 9-3-76 Travancore (Bourdillon).

B.N.H.S. Coll.: ♂ 29-9-93 Thekadi (Cook).

The range and status of these two forms in Travancore and Cochin seem utterly confusing and it is impossible to say anything definite regarding them. The difficulty is heightened by the fact that both races may commonly be met with together and even in one and the same flock. Thus No. 928 (*malabarica*) was shot from a party which contained two or three undoubted *blythii*. In addition, there is every inter-gradation of colour between the grey-headed *malabarica* and the white-headed *blythii*, while it is practically impossible to tell females and immature males of the latter from *malabarica*.

On the whole, however, the specimens confirm that *blythii* is probably the breeding form in Travancore and that *malabarica* only appears in this area as a winter visitor. None of the specimens attributed to *malabarica* showed any gonadal development, while No. 255 (9 February—*blythii*) had its testis (only a single !) enlarged to breeding size—13×10 mm.—and 453 (17 March—*blythii*) to 10×7 mm. On 4 March, two pairs were observed building in holes in partially submerged tree-trunks in Periyār Lake which, judging from the males, were undoubted *blythii*. Several other pairs were also noted prospecting for nesting sites here between 28 February and 7 March, all of which seemed to belong to the white-headed form. A half-fledged young was brought in by an urchin on 25 March at Tenmalāi, but its parents were unfortunately not seen.

Specimen No. 545—an adult male *malabarica*—on the other hand showed no genital development on 9 April at which time *blythii* were breeding generally. Moreover it was very fat, a condition which at this season indicates in true migrants their readiness to depart. Whether it can be interpreted in the same light in the case of local migrants, as the Grey-headed Myna seems to be, is of course open to question.

In Travancore and Cochin, these Mynas frequent secondary jungle and the neighbourhood of cultivation usually in the low country and foothills, but also up to about 3,500 ft. elevation. They keep in flocks of 5 to 20 birds or more, and I found them feeding largely on *Lantana* berries, Peepal and

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various other *Ficus* figs and the nectar of *Bombax malabaricum* flowers. On these trees they indulge in the same sort of squabbling, chatter and bellicosity as the Rose-coloured Starling. Occasionally they were also observed springing open *Loranthus* buds and probing into them for the nectar.

Fairbank (*S.F.*, v) does not record either of these forms in the Pālni Hills, but according to the *Fauna* (iii, 41) *blythii* breeds there and is apparently a resident.

This species is not found in Ceylon.

Breeding: On the evidence obtained by the Survey nesting of the white-headed form—*blythii*—in Travancore is in progress during March and April and probably also May.

Col. Sparrow took 2 fresh eggs at Kūmili (Cardamom Hills) on 4 April. He attributes these to the grey-headed typical race, but as he did not shoot the parents, the uncertainty remains.

Stewart and Bourdillon took eggs of *Sturnia m. blythii* in Travancore in March and April (*Nidification*, ii, 519).

Temenuchus pagodarum (Gmelin). The Black-headed or Brahminy Myna.

Specimen collected: 547 ♂ 9-4-33 Cape Comorin ca. S.L.

Elsewhere noted at: Kottāyam (ca. S.L.); Arāmboli (250 ft.); Chālakūdi and in the low country along the Cochin Forest Tramway; Wadakkāncheri (400 ft.); Karūpadanna (ca. S.L.).

Colours of bare parts: 'Iris white; bill blue at base, bright yellow at tip; legs, feet and claws yellow' (Humayun Abdulali).

[Additional specimen seen:

Brit. Mus. Coll.: ♂ 6-6-77 Periakulam, E. base of Pālnis (Fairbank).

The juvenile differs from the adult in being paler and duller throughout and lacking the crest, while the pronounced shaft streaks on the hackled tips to the feathers are wanting. Cap dark sooty brown. Ear-coverts and lower parts—save for the white vent and lower tail-coverts—are warm creamy unicolorous buff. The post-juvenal moult is complete and the first winter bird cannot be distinguished from the adult. There is no spring moult. The complete autumn moult takes place in October and November. The adult female differs from the male merely in having a shorter crest.—H. W.]

The Black-headed Myna is restricted in Travancore and Cochin to the low country under 500 ft. elevation, where it frequents deciduous and secondary scrub jungle about cultivation and human habitations. Flocks of up to 8 or 10 birds were not uncommon, often in association with other Mynas, and they fed extensively on Banyan figs, *Lantana* and *Salvadora persica* berries in the usual mixed company of frugivorous birds.

In the Pālni Hills Fairbank (*S.F.*, v, 407) obtained specimens at the base and also observed it well up on the hillsides, presumably on the eastern (drier) side.

In Ceylon it is confined to the dry coastal areas.

Breeding: The specimen (9 April) was very fat and its organs showed no departure from the quiescent condition. Ferguson (*J.B.N.H.S.*, xv, 462) does not comment upon the status of this Myna in Travancore. No records of its breeding there or in Cochin exist and it may be that, as in many other parts of its range, it is only a winter visitor to the area.

Acridotheres tristis tristis Linn. The Common Myna.

Specimens collected: 227 ♂ 6-2-33, 277 ♂ 12-2-33 Thattākād 200 ft.: 534 ♂ 8-4-33, 574 ♀, 575 ♂ 12-4-33 Cape Comorin S.L.; 621 ♂ 18-4-33, 632 ♀ 20-4-33 Arāmboli 250 ft.; 711 ♂ 23-7-33 (Beach); 747 ♂ imm. 30-7-33 (Veli, S.L.); 779 ♀ 3-8-33 (Kovālam ca. 70 ft.); 839 ♀ 12-8-33 (Beach) Trivandrum Town and Tālūk; 963 ♂ 9-12-33 Nemmāra 300 ft.

Elsewhere noted at: Marāiyūr (3,000 ft.); Kottāyam (ca. S.L.); Chālakūdi; Wadakkāncheri (400 ft.); Trichūr Town; Karūpadanna (ca. S.L.); Ernākūlam.

Colours of bare parts: *Adult*: Iris brown (according to Pillai 'outermost ring greyish-white, succeeded by a ring of fine silver spots surrounding a brownish-red ring which encircles the pupil'); bill yellowish except at sides

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of base of lower mandible which are brownish-green; orbital skin bright yellow; mouth dark slate; legs, feet and claws yellow like bill, paler than the bare orbital skin. *Immature*: Iris 'blackish-grey' (Pillai); gape yellow; mouth more pinkish; orbital skin paler; rest as in adult. *Juvenile* (½ fledged): Iris brown; bill dusky yellowish flesh colour; gape yellowish-cream; mouth bright yellow; legs and feet pale yellowish-flesh; claws dusky.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
7 ♂♂	25.5-30.5	139-150	81.5-90.5	38-40 mm.
3 ♀♀	26-27	138-142.5	78.5-85.5	35-39 mm.

This good series clearly establishes the fact that Mynas from Travancore are intermediate between *A. t. tristis* and *A. t. melanosternus* and some would be inclined to name them as another of the Travancore races. Compared with birds from N.-W. India they are certainly darker with a more purple tint on the lower plumage, and the white of the ventral patch is somewhat constricted. The upper parts average darker and closely resemble those of *melanosternus*. Below, however, they are not as dark as the latter and they have fewer traces of the extension of the black of the chin, throat and upper breast as a ventral band. I do not think, however, that the naming of this intermediate race would prove of value as the typical race is somewhat variable in colour and size and throughout its range a number of individuals approach these Travancore intermediates in colour. It is better to be content with the statement that while the Myna in India cannot be divided into races—as one might perhaps expect from the robust adaptability of this common bird—the fact may be remembered that it shows a tendency to develop a pale race in the extreme North-West and a saturated race in Travancore.—H. W.]

The Common Myna is an abundant and familiar resident species in the low country of both Travancore and Cochin. Apart from Marāiyūr which is in many respects an exceptional locality with a mixture of hills and plains features, it was not found at all above an elevation of about 400 ft. As elsewhere, it inhabits open country about cultivation and towns and villages.

In the Pālni Hills, Fairbank (*S.F.*, v, 407) found it common about villages at nearly 4,000 ft.

It is a common species in Ceylon.

Breeding: On 4 February (Thattākād) a pair was observed nesting in a hollow about 35 ft. up in a charred tree-trunk standing in a paddy-clearing in deciduous forest. When visited again on 6 February, this tree had been felled. Examination of the nest showed a partially fledged nestling sitting at the entrance, hale and hearty and quite unhurt by the fall! No. 277 (12 February) had testes enlarged to 8×5 mm. On 6 April (Cape Comorin) a nest was located in a hole in a palmyra palm trunk at about 20 ft., while another pair was observed building on 13 April. In specimen No. 534 (8 April) the testes measured ca. 5×4 mm. and appeared to be developing, whereas in other specimens at this time the gonads were as yet in a quiescent state. No. 621 (18 April) had testes measuring 9×5 mm., while 632 (20 April) had one hard shelled egg in its oviduct ready for laying, and the distended nature of this organ indicated that others had already been laid. Among the later specimens Nos. 711 (23 July) with testes measuring 12×6 mm. and 779 (3 August) with the largest ovarian follicle ca. 2 mm. in diameter were obviously breeding. No. 747 (30 July) was immature with imperfectly ossified skull.

Ferguson says (*J.B.N.H.S.*, xv, 462) that the Myna breeds in April in Travancore. The evidence shows that nesting operations commence about mid-January and continue till at least the first week in August and probably later, so that the breeding season in this area is a very protracted one.

Æthiopsar fuscus mahrattensis (Sykes). The Southern Jungle Myna.

Specimen collected: 172 ♂ 28-1-33 Sānthanpāra 3,500 ft.

Elsewhere noted at: Marāiyūr (3,000 ft.—more common and abundant than the foregoing species); Mūnnār (5,000 ft.—Kanan Devan Hills—abundant); Thattākād (200 ft.); Kottāyam (ca. S.L.); Peermade (3,200 ft. fairly

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common); Kūmili (3,000 ft.—Cardamom Hills—common); Trivandrum Town (ca. S.L.); Wadakkāncheri (400 ft.); Karūpadanna (ca. S.L.).

Colours of bare parts: Iris bluish-white; bill orange-yellow, dark brown at nostrils, gape and base of lower mandible; mouth dark slate; legs and feet yellow; claws brown.

[The one ♂ measures:

Bill.	Wing.	Tail.	Tarsus.
27.5	131.5	78	35.5 mm.—H. W.]

The statement by Ferguson (*J.B.N.H.S.*, xv, 463) to the effect that this species does not ascend the Travancore hills seems surprising, and it certainly is not correct at the present time. The Survey found it fairly common both in the low and foothills country of Travancore and conspicuously so in the hills where it occurs to the exclusion of the Common Myna. Its distribution, however, is patchy; for example it was absent in the Ashāmbū Hills and my notes do not record it from Rājampāra, Camp Derāmalāi or Pādagiri.

At Marāiyūr and in the low country, the Jungle Myna was frequently observed in mixed flocks with the Common Myna, grubbing amongst flooded fallow fields or attending on grazing cattle. They fed largely on *Ficus* figs of various species, *Lantana* berries and on the nectar of *Erythrina* (*lithosperma* and other species) blossoms. The specimen, shot off these, had a quantity of pollen adhering to its throat and tuft feathers. The tuft at the base of the culmen acts as an efficient pollen brush.

This Myna has apparently not been recorded from the Pālni Hills and it does not occur in Ceylon.

Breeding: The organs of the specimen (28 January) were in normal non-breeding condition. At Peermade, on 24 February, a pair were observed building in a hollow in a tree-trunk, 8 ft. up, in the compound of the Travellers' Bungalow, and on 4 March several pairs were busy nesting in holes in the partially submerged tree-trunks standing in Periyār Lake.

No published records of its breeding in Travancore or Cochin exist. According to the *Fauna* (iii, 58) the Jungle Myna breeds in South India from February to May and this season evidently applies to our area as well.

Family: Ploceidæ.

Ploceus philippinus travancoreensis subsp. nov. The Travancore Baya or Weaver-Bird.

Specimens collected: 316 ♂, 317 ♂, 318 ♀ 19-2-33 Kottāyam ca. S.L.; 678 ♀ imm. 16-7-33 (Beach); 726 ♂, 727 ♂ 26-7-33, 741 [♂ ?] 29-7-33 (Kūttāni 300 ft.); 785 ♂ imm. 4-8-33 (Cattle Farm 150 ft.) Trivandrum Tālūk; 913 ♂ imm. 27-11-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Marāiyūr (3,000 ft.; only old nest colonies !).

Colours of bare parts: Iris hazel brown; bill horny-brown, yellowish at chin and gape; mouth pink; legs, feet and claws brownish flesh-colour. In the ♀ (318) the brown of the bill is paler.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂ adult.	18-20	70-75	41.5-48	20-21 mm.
2 ♂♂ juv.	—	68-70	40-42.5	— mm.
1 ♀	20	72.5	moult	19.5 mm.

These Weavers can certainly not be retained with the typical race. The upper plumage is much darker and browner, while the breast and flanks have a more pronounced brown wash, the shaft streaks being more defined and at the base broader than is usual in the typical race. On these features alone I am prepared to separate this as another of the peculiar Travancore forms and propose for it the name:

Ploceus philippinus travancoreensis subsp. nov.

Type: No. 317 ♂ (breeding) 19-2-1933 Kottāyam (Backwaters), sea level, Coll.: Sálim Ali. Deposited in British Museum.

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There is a further point of interest connected with this series. It contains 4 breeding males—in all of which the organs were enlarged—and none of these have attained the full breeding plumage as known in the typical form. The type has a yellow crown, a fairly developed black throat patch and odd golden feathers on the breast. The other three lack the throat patch and the yellow crown and have the yellow on the breast represented only by odd feathers. One has a yellow wash on the crown, the other two have the supercilium yellow. It is impossible to be dogmatic on so small a series, and the specimens may not be mature, but they suggest that in this race as in *burmanicus*, the normal breeding plumage is largely suppressed. If so, this will be a further character of the race.—H. W.]

Beyond the low country, signs of the Baya were noted only at Marāiyūr (3,000 ft.). Here, two or three small colonies consisting of from 3 to 8 disused nests each were observed suspended on mango trees amidst terraced paddy-fields in the valley lying fallow at this season (early January). From the fact that all the nests hung on the eastern side of the trees, it may be presumed that the birds nested here during the south-west monsoon and that they only came up for breeding purposes while the paddy crops were standing and departed after that function had been performed and the paddy harvested.

In the low country of Travancore and Cochin and about the backwaters, where paddy is the principal crop grown, the Baya is common and its works abundantly in evidence in the neighbourhood of this cultivation. In the dry season the birds keep mainly to the backwaters, but spread out during the monsoon over most of the low country.

In the Pālni Hills it of course does not occur, but it is found in suitable localities in Ceylon.

Breeding: Specimen No. 316 (breeding plumage; testes 8×6 mm.), 317 (breeding plumage; testes 9×5 mm.) and 318 (ovarian follicles over 1 mm. in diameter) were all shot on 19 February off a colony of about 25 nests in various stages—some completed and occupied by females, others barely begun. They hung from the fronds of a cocoanut palm (ca. 50 ft. up) in a hamlet on the banks of Vembanād backwaters. The breeding season of the Baya in this area, as elsewhere, seems to be directly correlated with paddy cultivation which provides the birds with both nesting material and food for themselves and their young. In localities where paddy cultivation is dependent wholly upon the rainy season, it is well known that nesting operations do not commence until after the monsoon has well set in and the paddy plants or the coarse saw-edged grasses which supply the building material are several inches high. In the backwaters where irrigation is perennial, paddy crops were standing at this period (middle February) ready to be harvested in about a fortnight. As soon as this crop is reaped a second sowing is made which ripens before the south-west monsoon sets in. During the monsoon months all the paddy land in the region of the backwaters is completely submerged so that Bayas can only continue to breed in this neighbourhood from early in the year up till the commencement of the south-west monsoon in May or June, or more precisely between the end of one monsoon and the beginning of the next. During the rainy season therefore the Bayas resort to the neighbourhood of the regular paddy cultivation further inland, and this is presumably the explanation for the deserted nest colony in January at Marāiyūr. Two of the July specimens (726 and 727) had enlarged organs and were ready to breed, and Pillai notes that on 4 August nesting activities were still in full swing near the Cattle Farm. Two of the July/August specimens are immature with yellow gapes and imperfectly ossified skulls.

It is evident that on account of the favourable conditions obtaining in Travancore as regards paddy cultivation, Bayas breed here practically throughout the year, most probably in shifts or relays as they become sexually mature.[1]

[1] At my request Mr. Pillai visited the Kottayam backwaters in the middle of December (1935) in search of further breeding specimens. He found that paddy cultivation there had only just commenced and he failed altogether to come across any Bayas at that time.

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According to *Nidification* (iii, 3) Bourdillon took many nests with eggs in Travancore in May and thence onwards to August.

In our experience, paddy leaf is the building material exclusively, or at least most extensively, used in Travancore and Cochin. We did not see any nests made of cocoanut fibre, as have been described, inspite of the great abundance and availability of this material. The birds are capricious in regard to the selection of sites. Cocoanut palms are largely patronised, but sometimes a couple of palmyra palms standing amidst a cocoanut grove or in its vicinity seemed to be the centre of attraction, all the nests being concentrated upon them.

Ploceus manyar flaviceps Lesson. The Madras Streaked Weaver Bird.

Specimen collected: 288 ♂ 15-2-33 Vembanād backwaters, Kottāyam.
Elsewhere not noted.

Colours of bare parts: Iris brown; bill brownish-horn, paler at commissure; legs and feet brownish-pink; claws dusky.

[Other Travancore specimens seen:
Brit. Mus. Coll.: ♂ and juv. 21-6-77 Vellarney Lake (Hume Coll.).
The Survey specimen—♂ in breeding plumage—measures:

Bill.	Wing.	Tail.
18.5	71	45 mm.—H. W.]

Ferguson (*J.B.N.H.S.*, xv, 468) describes this Weaver as confined to the plains in Travancore, where it is not common. The Survey only came across it by the Vembanād backwaters near Kottāyam where the birds were breeding and fairly numerous, though only in patches.

It is a local resident in Ceylon.

Breeding: The specimen (15 February—breeding plumage) had enlarged testes measuring 7×5 mm. and it was busy collecting strips of the coarse saw-edged grass that grows so plentifully on bunds and dykes along the backwaters. A colony of 15 nests was located on the same date among tufts of tall grass and *Pandanus* thickets growing on a small islet in the backwater, barely three yards by two. The nests were smaller than those of *Ploceus philippinus*, woven more loosely and roughly, and in texture rather resembling those of the Indian Wren-Warbler. They lacked the prolonged entrance tubes and had only slight 'porches'. Pellets of mud were plastered within as is the case with the Common Baya. The colony contained several unfinished nests in various stages, and among the birds a preponderance of males in breeding dress over females was noticed. Of the completed nests examined, one contained 3 eggs, 3 nests 2 eggs each, and 1 contained a single. Two eggs taken, measured 19×13.5 and 19×14 mm. respectively.

T. F. Bourdillon (*S.F.*, vii, 39) found thousands beginning to build in June amongst the reeds which formed floating islands in the Vellayāni Lake about 6 miles from Trivandrum. *Nidification* (iii, 9) adds that the same observer found it breeding in Travancore from July to September. These reed beds have since disappeared and with them the nesting colonies of the Streaked Weaver-bird.

I should not be surprised if, like the Common Baya, this species is also found to breed in the Travancore-Cochin area over a considerable part of the year, varying with local conditions. In Northern India birds in February and March are in eclipse plumage and breed about September. Waif (*Birds of Ceylon*, p. 115) says that the breeding season on the island is in February and March and again in June.

Munia malacca (Linn.). The Black-headed Munia.

Specimens collected: 257 ♀, 258 ♂, 259 ♂ 10-2-33 Thattākād 200 ft.
Elsewhere not noted.

Colours of bare parts: Iris brown; bill pale bluish-grey, dusky on culmen; mouth cream colour with slaty crescent and blotches; legs and feet slate; claws horny-brown.

[Other specimens examined:
Brit. Mus. Coll.: ♂ 21-6-77 Vellarney Lake (Hume Coll.).

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B.N.H.S. Coll.: o?, ♀ 20-7-93 Kodaikanal (Pālnis); ♂ 31-1-01 Devicolam [Travancore] (Ferguson).

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
2 ♂♂	13-13.5	55.5-56	32	16 mm.
3 ♀♀	13-13.5	53-55.5	30.5-35	16-16.5 mm.—H. W.]

The Travancore Survey only once came across a single flock of 20 to 25 birds in the vicinity of standing irrigated paddy crops in a clearing in deciduous jungle. All the 3 specimens secured were undergoing complete moult.

According to Ferguson (*J.B.N.H.S.*, xv, 468) it is only found in the low country of Travancore where flocks may often be met with especially about the backwaters. Stewart apparently found them in the hills also, to what elevation is not stated.

In the Pālni Hills, Terry (*S.F.*, x, 478) found it fairly common in the Lower Pālnis and breeding in the Pittur Valley in April. There is a specimen from Kodaikanal in the Bombay Natural History Society's Collection.

The Black-headed Munia is a locally distributed resident in Ceylon.

Breeding: The Survey procured no data on the nesting of this species in Travancore or Cochin. Bourdillon (*S.F.*, vii, 39) found it breeding among the reeds in Vellayāni Lake (near Trivandrum) in June. Stewart also obtained nests in grass fields in Travancore (*Nidification*, iii, 14) but the season is not mentioned; Ferguson gives the breeding season here as May to August.

Uroloncha striata striata (Linn.). The White-backed Munia.

Specimens collected: 314 ♂, 315 ♀ 19-2-33 Kottāyam ca. S.L.; 418 ♂, 419 ♀ 7-3-33 Kūmili 3,000 ft.

Elsewhere noted at: Thattākād (200 ft.); Nemmāra (300 ft.); Karūpadanna (S.L.).

Colours of bare parts: Iris brown; bill, upper mandible horny-black, lower bluish-grey; mouth pinkish-grey or pale yellow and grey; legs, feet and claws slate or slaty-brown.

[No other Travancore specimens seen.

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
2 ♂♂	13-13.5	51-54	38	13.5 mm.
2 ♀♀	13.5	53-54	38.5-39	13 mm.—H. W.]

The White-backed Munia is, as Ferguson observes, commoner in Travancore —also in Cochin—than the foregoing species, though far from generally distributed. The Surveys came across it in the low country as well as, to a lesser extent, in the hills up to 3,000 ft. elevation. Flocks of 8 to 15 birds and smaller parties were usually observed about paddy cultivation in forest clearings, in fruit gardens by homesteads along the backwaters, and also in lightly wooded cultivated country generally.

In the Pālni Hills, Terry (*S.F.*, x, 478) found a flock in the Pittur Valley, but says nothing about its status. It is a common species in Ceylon up to 2,500 ft. and in parts up to 4,000 ft.

Breeding: Specimens Nos. 314 and 315 (19 February) were a pair building in a pollarded *Thespesia populnea* tree, about 7 ft. up, near a backwater homestead. The testes of the former measured 5×4 mm., while the largest ovarian follicle of the latter was about 4 mm. in diameter. The gonads of the other 2 specimens were in a quiescent state.

'In Travancore Stewart and Bourdillon obtained eggs from May to August, but both say that odd nests with young or eggs may be found in any month. . . . Bourdillon speaks of clutches of 8 eggs.' (*Nidification*, iii, 18).

Uroloncha kelaarti jerdoni (Hume). The Rufous-bellied Munia.

Specimens collected: 187 ♀ imm., 188 ♀ 30-1-33 Sānthanpāra 3,500 ft.; 250 ♀ 9-2-33 Thattākād 200 ft.; 671 ♂ 26-4-33 Balamore Estate 2,000 ft.

Elsewhere noted at: Marāiyūr (3,000 ft.); Wadakkāncheri (400 ft.); Pādagiri (3,000 ft.—Nelliampathy Hills).

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Colours of bare parts: Iris brown; bill dark horny-brown, bluish at chin and base of lower mandible; mouth slate with pale yellow crescent on palate and patches of the same colour; legs and feet greenish-plumbeous; claws horny-brown. The immature (No. 187) differed from the adults in having the mouth cream colour, blotched with slaty and in having no greenish tinge on the legs and feet.

[A small series from Travancore (Fry and Bourdillon) in the British Museum examined, but I have omitted to note details of individuals.

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	14	56.5	43	13.5 mm.
3 ♀♀	13-13.5	57-58	36.5-38	14-15 mm.—H. W.]

This is a fairly common resident species in Travancore and Cochin, more or less confined to the hilly portions though also met with by the Surveys sparingly in the foothills country, but not at all in the succeeding plains belt or on the coast. It frequented scrub and grassland sometimes in the proximity of cooly-lines or hillmen's settlements on the edge of jungle and tea plantations, in small parties of 3 or 4 or flocks of up to 30 or more birds.

It is apparently common in the Palni Hills. In Ceylon, the typical race *U. k. kelaarti* (Jerdon) is found in the hills above 2,000 ft.

Breeding: No. 187 (30 January) was immature with very imperfectly ossified skull and in worn juvenile plumage. No. 671 (26 April) had testes measuring 4×3 mm. and it was undergoing pre-nuptial moult. No other data in this regard was procured by the Surveys.

T. F. Bourdillon (*J.B.N.H.S.*, xv, 468) gives the breeding season in Travancore as June to August and says that the birds nest at elevations of 2,000 ft. and upwards. Six to eight eggs is said to be the normal clutch.

Urolonchа malabarica (Linn.). The White-throated Munia.

Specimens collected: 559 ♂ 10-4-33 Cape Comorin ca. S.L.; 631 ♀ 20-4-33 Arāmboli 250 ft.

Elsewhere not noted.

Colours of bare parts: Iris brown; upper mandible horny-brown, lower bluish-grey; mouth grey and pink; legs, feet and claws greyish-pink.

[Plumage too worn for measurements. No other Travancore specimens seen.—H. W.]

I can fully endorse Ferguson's statement (*J.B.N.H.S.*, xv, 469) that in Travancore this Munia is only found in the dry open country about Cape Comorin—up to approximately the Arāmboli Gap—where it is fairly common, being also the only Munia met with. It was observed in pairs, family parties or small flocks feeding on grass-seeds, etc.

In Ceylon also the distribution of this species is restricted to the dry areas in the north.

Breeding: Both the specimens (10 and 20 April) had slightly enlarged gonads. The male was in heavy general moult and the female in very worn plumage. On 19 April a bird was observed carrying building material—a grass blade—in its bill, so evidently some nesting at any rate was in progress then.

Ferguson gives the breeding season as December to March.

Uroloncha punctulata lineoventer (Hodgson). The Spotted Munia.

Specimens collected: 728 ♂ 26-7-33 (Kūttāni 300 ft.); 765 ♂ 1-8-33 (Beach) Trivandrum Tālūk and Town; 934 ♂ 3-12-33, 943 ♂ 5-12-33, 966 ♂ 10-12-33 Nemmāra 300 ft.; 1045 ♂ 30-12-33 Karūpadanna ca. S.L.

Elsewhere not noted.

Colours of bare parts: Iris orange-brown; bill slaty-black, blue-grey at base of lower mandible; mouth slaty-grey with cream-coloured crescent on palate; legs and feet bluish-slate; claws brown.

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[Measurements:

	Bill.	Wing.	Tail.
5 ♂♂ (breeding plumage)	12-13.5	57-58.5	37-41 mm.
1 ♂ (brown plumage)	12.5	54	33 mm.

Additional specimens examined:

Brit. Mus. Coll.: ♀ 17-6-77, ♀ 12-6-77 Lower Pālnis (Fairbank).

I have not yet been able to work out—for lack of the necessary moulting specimens—the relationship between the brown and spangled plumages.—H. W.]

The Surveys found the Spotted Munia much more generally distributed in the low country in Cochin than in Travancore, nowhere above 300 ft. elevation, and as Ferguson says (*J.B.N.H.S.*, xv, 469) it evidently does not ascend the hills in this area. This is curious because in the Nilgiris I found several nests at Kotāgiri (ca. 6,300 ft.) in July and August, and a pair were building in the Ootacamund Botanical Gardens (ca. 7,000 ft.) on 27 September.

The birds were met with in pairs, small parties and flocks—one of over 70—in the neighbourhood of paddy cultivation in hummocky country. It was observed that the flocks in December comprised chiefly of birds in the plain brown plumage. Its food seemed to consist very largely of ripening paddy grains supplemented by grass-seeds. The crops and stomachs of the specimens were gorged with the grains. The crop of one contained 14 entire grains of green paddy, while its stomach was packed with broken pieces of the same.

Fairbank met with this species twice in the Lower Pālnis, but unfortunately does not comment upon its status there. In Ceylon it is generally distributed up to 2,500 ft. and locally to 4,000 ft.

Breeding: The July and August specimens both had testes enlarged to 6×4 mm. They were in fresh spotted plumage and evidently breeding. Of the four December specimens, Nos. 434 (3 December—testes 4×3 mm.—incubation patch !) had probably lately finished breeding. No. 943 (5 December—testes 6×4 mm.) a partial albino, was in very worn dress and moulting primaries, secondaries and rectrices. It had either just finished breeding or was changing into pre-nuptial dress. No. 966 (10 December) in plain brown plumage had undeveloped organs. Unfortunately its skull was damaged by shot which rendered age determination impossible. No. 1045 (30 December—testes 5×4 mm.—spotted plumage) was apparently breeding.

According to Ferguson, this Munia breeds in Travancore from April to July. From the evidence provided by the Survey specimens and the data collected in the field, it seems more likely that breeding continues irregularly, more or less throughout the year.

Amandava amandava amandava Linn. The Red Munia.

This Munia has not been recorded in Travancore or Cochin, but Terry found a large flock at Pulungi in the Pālni Hills in April (*S.F.*, x, 478).

Family: Fringillidæ.

Carpodacus erythrinus roseatus (Blyth). The Common Indian or Hodgson's Rose-Finch.

Specimens collected: 24 ♂ 6-1-33 Marāiyūr 3,000 ft.; 105 ♂ 18-1-33 Munnār 5,000 ft.; 993 ♀ 18-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Sānthanpāra (3,500 ft.—Cardamom Hills).

Colours of bare parts: Iris brown; bill, legs, feet and claws horny-brown.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
2 ad. ♂♂	14.5	85.5-87	55-59	17.5-19 mm.
1 ♀	15	84.5	—	18.5 mm.

No other specimens from Travancore seen.

The juvenile closely resembles the adult female. I have not seen the post-juvenal moult, but young birds in their first winter and summer still resemble the adult female and cannot be distinguished in any way from her.

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Many males breed in this plumage but I have seen no evidence to show whether it is moulted at the second autumn between August and October or whether it is retained and adult males must be considered dimorphic.

Adults have a complete post-nuptial moult from August to October. There is no pre-nuptial moult and the plumage in consequence becomes considerably worn in summer. The female then becomes much duller and browner. The male changes considerably in appearance as a result of the wearing off of the feather edges and an apparent increase of colour owing to the prismatic effect of transmitted light on the worn surface.[1]—H. W.]

The Rose-Finch is a common winter visitor to the northern hill ranges of Travancore. Kinloch records it as fairly common in the Nelliampathy Hills (Cochin) and Ferguson found it in the High Range. The southernmost point at which the Surveys came across it was in the Cardamom Hills at ca. 10°N. lat. It goes about in small flocks of usually up to about 20 birds, frequenting scrub country on the outskirts of evergreen sholas and hillmen's settlements, and cardamom, tea and coffee plantations. The highest elevation at which the Surveys came across them was about 7,000 ft. (above Marāiyūr) in *Rubus* thickets bordering hill streams.

Their food was observed to consist largely of the berries of *Lantana camara, Maesa perrottetiana* and *Trema orientalis*—also seeds and flower buds of *Polygonum chinense* L.—while they regularly visited *Erythrina lithosperma* shade trees in coffee plantations for the nectar of their blossoms. The chin of a specimen shot off these was coated with pollen.

The Rose-Finch has apparently not been recorded in the Pālni Hills nor has it yet occurred in Ceylon.

Gymnorhis xanthocollis xanthocollis (Burton). The Yellow-throated Sparrow.

Specimens collected: 507 ♂ 4-4-33 Trivandrum Town; 560 ♂ 10-4-33 Cape Comorin; 897 ♂ 24-11-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Marāiyūr (3,000 ft.); Thattākād (200 ft.); Kottāyam (ca. S.L.); Vadāserikara (ca. 400 ft.—near Rājampāra); Arāmboli (250 ft.); Nemmāra (300 ft.); Karūpadanna (ca. S.L.).

Colours of bare parts: Iris brown; bill brownish-black; mouth greyish-pink; legs, feet and claws brownish flesh colour.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
3 ♂♂	15-17	83-86	50-53	16-17.5 mm.

Other specimens examined:

Trivandrum Mus.: ♀ 7-7-07 Arāmboli.

Also 4 Fry and Anjango birds in the British Museum without data.

The post-nuptial moult in this species is complete, and there is no pre-nuptial moult. The post-juvenal moult is said by Ticehurst to be complete.—H. W.]

The Yellow-throated Sparrow is fairly common in the drier portions of the low country of both Travancore and Cochin where it frequents the neighbourhood of cultivation and backwater homesteads, and also light deciduous jungle. In the cold weather they were observed keeping in flocks, often of considerable size, gleaning paddy grains in harvested fields and feeding extensively on *Lantana* berries and on the nectar of *Bombax* and *Erythrina* flowers in mixed avian company. At this season, large numbers usually congregated into leafy bamboo clumps or bushy trees during the heat of the day and created a great noise with their chirping. Except at Marāiyūr, it

[1] Two males, apparently of this race, in the aviary of Sahebzada Dr. Saiduzzafar Khan (Dehra Dun) moulted at the end of October from the adult rose-coloured plumage into one closely resembling the female but with the chin, cheeks and throat a more or less immaculate vinous-buff. At the time of writing (6 December) this plumage remains unchanged although in the wild state males (at least some) may still be seen in the rose-coloured plumage. I do not find this eclipse plumage of the male recorded in the literature.—S. A.

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was not met with above about 500 ft. elevation. Already by the first week of February, the flocks had started breaking up, and by the beginning of April, pairs had become the rule and courtship was in progress generally.

It does not ascend the Pālni Hills, but Fairbank (*S.F.*, v, 408) found it plentiful at Periakulam near their eastern (dry) base. In Ceylon it is only a straggler.

Breeding: No. 560 (10 April) had testes measuring 7×5 mm. and it was breeding. On 12 April a pair were observed feeding young in a hollow 7 ft. up a *Thespesia* trunk (Cape Comorin) and on 13 April another nest was in occupation.

Ferguson (*J.B.N.H.S.*, xv, 469) states that in Travancore this species breeds in May and June.

Passer domesticus indicus Jardine & Selby. The Indian House-Sparrow.

Specimens collected: 53 ♂, 54 ♀ 10-1-33 Marāiyūr 3,500 ft.; 518 ♂, 519 ♂, 520 ♀ 7-4-33, 586 ♂ 13-4-33 Cape Comorin ca. S.L.; 629 ♂ 19-4-33 Arāmboli 250 ft.; 678 ♀ 16-7-33, 714 ♂ 23-7-33, 764 ♀, 767 ♂ 1-8-33 Beach, Trivandrum.

Elsewhere noted at: Wadakkāncheri (400 ft.); Nemmāra (300 ft.); Trichūr; Karūpadanna (S.L.); Ernākūlam; Cochin Town.

Noted as absent (or exceedingly rare ?) at: Mūnnār (5,000 ft.); Kottāyam (ca. S.L.); Peermade (3,200 ft.); Kūmili (3,000 ft.—none observed, but said to occupy dwellings in town sparingly); Tenmalāi (500 ft.).

Colours of bare parts: Iris brown; bill in ♂ dark horny-brown to black, in ♀ and immature pale horny-brown; mouth yellowish-pink, pink, or slaty-pink varying with age; legs and feet brownish flesh colour; claws duskier.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
10 ♂♂	13-14.5	72-78	49-55.5	16-18 mm.
4 ♀♀	13.5-15	70.5-74	51-55	17.5-18.5 mm.

In the Eastern Ghats Survey (*J.B.N.H.S.*, xxxvi, 838) I commented on the fact that the available series of House-Sparrows from Southern India was a poor one but that as far as it went it allowed me to state that no difference either in size or colour could be distinguished between South Indian birds and birds from Northern India, south of the Himalayas. The good series obtained by the Surveys has now confirmed that view. The Travancore birds agree in colour, state for state, with my Punjab series and there is no appreciable difference in measurements:—

	Bill.	Wing.	Tail.	Tarsus.
8 ♂♂ Punjab	13.5-14	72.5-78	51.5-57	17-18 mm.
4 ♀♀ Punjab	14-15.5	72.5-77.5	53-54.5	17-20 mm.

In the Sparrow the post-juvenal moult is complete. There is no spring moult and the autumn moult is complete. The juvenile plumage is too well known to require description.—H. W.]

The distribution of the House-Sparrow in this area is curious. It is fairly general in the low country of Cochin, but becomes inexplicably patchy and capricious in North Travancore as will be seen from the gaps indicated above. In the low and coastal country of South Travancore it is common. Excepting at Marāiyūr—and possibly at Kūmili—both along the highways of communication between Travancore and the adjoining drier districts of Madras Presidency through the barrier of the ghats that separate them, it was not met with above an elevation of about 500 ft. Wherever present it was, of course, as a commensal of man.

In the Pālni Hills, Fairbank (*S.F.*, v, 408) found House-Sparrows in villages up to 5,000 ft. altitude. The same race, *indicus*, is abundantly resident in Ceylon.

Breeding: In the first week of January (1933) House-Sparrows were observed breeding commonly among the rafters and thatching of the huts in Marāiyūr village. The organs of Nos. 53 and 54 (10 January) confirmed this; the testes of the former measured 5×4 mm., while the ovarian follicles and distended oviduct of the latter indicated that it had lately finished laying.

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Of the April specimens, only 586 (13 April) with testes enlarged to 7×5 mm. was breeding, while in 519 (7 April) the testes were slightly developed (3×2 mm.) although its imperfectly ossified skull showed that the bird was as yet immature. In the second week of April, however, Sparrows were nesting freely in holes in the masonry sides of the Travellers' Bungalow well at Cape Comorin. This was also observed to be the case in the frontier Customs station at Arāmboli on 14 April.

The gonads of three of the July/August specimens indicated that breeding was still in progress at that time. In No. 714 (23 July) the testes measured 9×4 mm. while the largest ovarian follicle of 764 (1 August) was about 3 mm. in diameter.

On 3 January (1934) nesting was in progress on cornices etc. in the Guest House at Ernākūlam, and on the same date similar activity was noted in and about the historic synagogue of the White Jews in Cochin Town.

Ferguson says (*J.B.N.H.S.*, xv, 469) that the Sparrow breeds in Travancore in February and March, but the evidence shows that there is no definite season and that it does so more or less throughout the year.

Family: Hirundinidæ.

[**Delichon urbica** (Linnaeus). The House-Martin.

Not met with by the Surveys, neither recorded from this area by previous observers, but there is a specimen labelled 'Travancore' from Surgeon-General Fry in the British Museum with no more precise date. It is open to doubt whether this specimen was actually procured in Travancore or purchased from some dealer there, or perhaps even mislabelled.]

Riparia concolor (Sykes). The Dusky Crag Martin.

Specimens collected: 597 ♂ 15-4-33, 620 ♂ 18-4-33 Arāmboli 250 ft.: 886 ♂ 20-11-33 Kūriārkūtti 1,600 ft.

Elsewhere noted at: Pādagiri (at ca. 3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris brown; bill blackish-brown; mouth pale flesh colour; legs and feet pinkish-brown; claws horny brown.

[Measurements:

	Bill.	Wing.	Tail.
3 ♂♂	10-11	109.5-112.5	45-46 mm.

This is an extension of range as the Dusky Crag Martin was not previously known to occur south of the Nilgiris where according to William Davison it is found at all elevations as a not uncommon winter visitor, a few birds staying to breed.—H. W.]

The Dusky Crag Martin has not been recorded from the Travancore-Cochin area before. It was found to be very locally and patchily distributed in the low country as well as hills, and far from common. The birds were usually observed hawking insects in company with Common or Spine-tail Swifts over steep grass-covered hillsides with sheet rock or cliffs and scarps, up to about 5,000 ft. elevation.

The species has not occurred in the Pālni Hills and it does not extend to Ceylon.

Breeding: The testes of specimen No. 597 (15 April) measured about 3×2 mm., those of the other two (20 November and 18 April) being in a quiescent state. Both the April birds were undergoing complete post-nuptial moult. No. 620 (18 April) was one of a pair which had a nest on an inaccessible ledge of rock, ca. 40 ft. up, in the hills bordering the Arāmboli Gap. The contents of the nest could not be ascertained, but from the fact that the owners visited it every now and again, and their actions while there, I presume that it contained fairly grown young which the parents were feeding.

Elsewhere in its range, the Crag Martin breeds largely in February and March.

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Hirundo rustica gutturalis Scopoli. The Eastern Swallow.

Specimens collected: 289 o? 15-2-33, 299 ♂ 17-2-33, 305 ♂ juv. 18-2-33 Kottāyam (Vembanād Backwaters); 529 ♂, 530 ♂ 7-4-33, 578 ♂ 12-4-33 Cape Comorin; 1012 o? juv. 25-12-33 Karūpadanna ca. S.L.

Elsewhere not noted.

Colours of bare parts: Iris brown; bill, legs, feet and claws blackish-brown; mouth pinkish-yellow. In juvenile (No. 305) bright yellow.

[Additional specimen seen:

Brit. Mus. Coll.: ♀ 28-2-80 Quilon [Travancore] (Bourdillon).

In the Swallow, both in the typical race and in *H. r. gutturalis*, to which I attribute these specimens from their small size and broken breast band, both the post-juvenal moult and the post-nuptial moult of the adult are complete and appear to take place somewhat irregularly and slowly, occupying the greater part of the winter. There is no time for a spring moult as some of these specimens have still not completed their moult by April.

These specimens (adults and juveniles) are all, except No. 289 which has finished, in different stages of their moult and so cannot be measured.—H. W.]

The Surveys found this Swallow fairly common in the neighbourhood of paddy cultivation in the low country, especially the coastal region and about the backwaters, both in Travancore and Cochin. Ferguson (*J.B.N.H.S.*, xv, 470) describes it as a winter visitor to the *low* country in Travancore (and not *hill* country as is inadvertently stated in the Eastern Ghats Report, *J.B.N.H.S.*, xxxvi, 840). The birds were most abundant about the backwater paddy-fields where they were to be seen either perched on the tall grass stems or dyke stakes, or hawking insects over the standing crops or the surface of the water.

This species is a winter visitor to Ceylon.

The gonads of the specimens were in a quiescent state. No. 529 (7 April) was very fat suggesting that it was more or less ready to emigrate.

Hirundo javanica domicola Jerdon. The Nilgiri House-Swallow.

Specimens collected: 38 ♀, 39 ♂, 40 ♀ 9-1-33 Marāiyūr 3,500 ft.; 663 ♂, 664 o? juv., 665 ♂, 666 ♂ juv. 25-4-33 Marūthānkūzhi 4,000 ft. (Ashāmbū Hills); 1001 o?, 1002 o? 20-12-33 Pādagiri 3,000 ft.

Elsewhere not noted.

Colours of bare parts: *Adult*: Iris brown; bill brownish-black; mouth yellowish-pink; legs and feet horny-brown; claws like bill. *Immature*: Iris brown; bill horny-brown, yellow at gape; mouth and gape yellow; legs and feet pinkish-brown; claws horny-brown.

[Measurements:

	Bill.	Wing.	Tail.
2 ♂♂ ad.	10.5-11	103-104.5	46.5-47 mm.
2 ♀♀ ad.	10.5	103.5	44.5-45 mm.
3 juvs.	—	100-101.5	42-42.5 mm.

The juvenile is very similar to the adult but the upper parts are less metallic, the chestnut forehead is less defined and the chestnut of the chin, throat and breast is softer and paler. The rest of the lower parts are faintly washed with pinkish-white. The tertiaries and their coverts and the lower tail coverts are broadly edged at their tips with pinkish white. The outer tail feathers are blunter at the tip.

This good series confirms the distinctness of the South Indian race which differs from the typical race in the smaller bill and the greener gloss of the upper plumage.—H. W.]

The lowest elevation at which the Surveys came across the Nilgiri House-Swallow was about 3,000 ft. (Marāiyūr), and as Ferguson says (*J.B.N.H.S.*, xv, 470) it is usually found at 4,000 ft. and upwards in the hills of both Travancore and Cochin. Kinloch (*J.B.N.H.S.*, xxix, 564-5) records it from the Lily Downs of Cochin, ca. 4,700 ft. The birds were met with in fair numbers hawking insects over grassy hillsides and on the edge of tea plantations. No. 666—a juvenile—was observed being fed by its parent in mid-air.

This swallow probably occurs in the Pālni Hills, but there are no records thence. It is a resident in the Ceylon hills.

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Breeding: The gonads of the specimens furnished no indication as regards breeding, but skull examination and colours of bare parts showed that two of the birds procured on 25 April were juvenile and evidently lately out of nest. According to Bourdillon (*J.B.N.H.S.*, xv, 470) the breeding season in Travancore is March, April and May. It builds its mud nest, well lined with feathers, usually singly and not in colonies, under the eaves of a house or even against a rock. 1 to 3 eggs is said to be the normal clutch.

Hirundo daurica erythropygia Sykes. Sykes' Striated Swallow.

Specimens collected: 92 ♀ 14-1-33 Marāiyūr 3,000 ft.; 279 ♀, 280 ♀ 12-2-33 Thattākād 200 ft.; 638 ♀ 21-4-33 Arāmboli 250 ft.

Elsewhere noted at: Kottāyam (S.L.); Camp Derāmalāi (3,000 ft.—Panthalam Hills); Wadakkāncheri (400 ft.); Karūpadanna (ca. S.L.).

Colours of bare parts: Iris brown; bill, legs, feet and claws dark horny-brown (in No. 92 with a pinkish tinge); mouth pinkish-yellow.

[Measurements:

	Bill.	Wing.	Central tail feathers	Outer tail feathers
4 ♀♀	10-11	110-116.5	40-43.5	71-79 mm.

These 4 specimens have the chestnut rump-band slightly richer in colour than is usual, but I am not satisfied that this difference is of subspecific value. It is very slight in degree and the colour of the rump-band is apt to vary with wear and bleaching.

No other Travancore specimens seen except one in the British Museum without data from Surgeon-General Fry.—H. W.]

Sykes's Striated Swallow is fairly common in the low country of Travancore and Cochin and was also met with by the Surveys sparingly and capriciously in the hills up to about 3,500 ft. Ferguson (*J.B.N.H.S.*, xv, 470) shot a specimen in the High Range at over 5,000 ft. and Kinloch (*ibid.*, xxix, 564-5) records it ('*nepalensis*') on the Lily Downs of Cochin at about the same elevation.

In the Pālni Hills, Terry (*S.F.*, x, 469) saw this species at Pulungi in April. It is a rare straggler to Ceylon where the chestnut tinted *H. d. hyperythra* Layard is the resident form.

Breeding: Nos. 279 and 280 (12 February) had conspicuously granular ovaries which, with their more or less immaculate plumage, suggested that they were ready to breed shortly. No published record of its breeding in Travancore or Cochin exists, however, and the *Fauna* (iii, 251) even describes this bird only as a winter wanderer into our area.

Hirundo daurica subsp.?

Specimens collected: 1021 ♀, 1022 o?, 1023 o? imm., 1024 ♂ 27-12-33 Karūpadanna ca. S.L.

Elsewhere ?

Colours of bare parts as in the foregoing.

[These 4 swallows are all immature and by their measurements (wing: 114.5-117.5, central tail feathers: 37.5-43, outer tail feathers: 76.5-90 mm.) are evidently not *erythropygia*, for it will be remembered that the tail in the juvenile is always shorter than it will be in the adult. Correctly sexed young birds from the breeding ground of the various races are too rare in collections for me to have worked out the differences between the immature birds of different races, but these agree with other young birds found in India in winter which I have hitherto (provisionally) called *nepalensis*.—H. W.]

These swallows were shot out of a vast concourse of several hundred (or thousand ?) birds that collected morning after morning on some telegraph wires near the Travellers' Bungalow. They began assembling at about 7 o'clock and flew about in dense shoals or sat huddled together for over two furlongs of the line, all facing the sun and preening themselves. By about 9 or 9-30 they had usually all dispersed to feed. None were to be seen on the wires in the evenings and it was observed that the birds all retired to roost for the night among the reeds on small islets in the backwaters, which were white with their droppings.

(*To be continued*).

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HOG-HUNTING REMINISCENCES.

BY

J. C. A.

During the half century of the life of the Bombay Natural History Society no articles on pig-sticking—that is more realistic than hog-hunting!, have appeared in the *Journal*; so these reminiscences, dating back to 1889, may be of interest to readers, especially those new to the country.

Forty-six years is a long time to look back; yet do I most vividly recollect that tense moment when I first viewed 'the great grey boar'. 'There was something close to the water's edge, and my heart with one leap stood still,'—What a pity it is there was no poet in those days of the like of Lindsay Gordon to record in splendid verse the joys of the King of all Sports; though this is said in no carping spirit against the great epic song of the Hog-hunter, which will aptly find a place in these pages before we lay aside our phantom spear.

That first encounter with the redoubtable foe was soon after I entered upon the glorious life of an Indigo Planter in Tirhoot, that level, cultivated, country which lies between the mighty Ganges and its great tributary the Gandak river bringing icy floods from the snowy ranges of Nepal.

My Factory Manager was a splendid horseman and a noted G.R., for despite his inches—he was over six feet, he was thin as a lath so rode about 9 stone 10 pounds. Rightly could it be said of 'Bob' Crowdy—he raced under the name of 'Mr. Bob':—

'A rider unequalled, a sportsman complete,
A rum one to follow, a bad one to beat.'

Many are the tales which could be told of his reckless ways of putting even his racehorses and chasers into a trap without previous training; and as often as not he would scorn the high road and take short cuts across country to the terror of any less venturesome companion who might be with him. A dangerous man indeed to be alongside of! A counterpart he was of the famous John Mytton.

With such a chief, it was not long before I possessed a modest stable and entered into the varied sports of those days. It was on a pretty warm morning in the early part of May that six of us were out in pursuit of pig. We were beating some '*ijer*' jungle, consisting of fair-sized trees which favour low-lying, swampy, ground. E and I were together, as we separated ourselves into three heats. Some time after the beat started a fine old grey boar broke on our side, and giving the usual 'law' we raced after him, but before we got on terms he went into a deep nullah in which were some wild rose bushes standing in water. Nothing would induce him to show, though his grim form could be dimly made out in the not very thick cover.

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In the meantime Bob Crowdy's heat came along and 'Take the shot gun and tickle him up' was the instruction to me, the novice at the game. So, the gun taken from an attendant, it seemed simultaneous with the arrival of the insulting pellets that the boar had floored my pony and myself! Fortunately for us, when we recovered from the mix up, the pig had spotted one of the beaters and made for him. The man had the presence of mind to throw himself flat on the ground, and before any damage could be done Crowdy rode up and pricked the boar with his spear; he dared not spear heavily for fear of injuring the man. At this fresh insult the boar charged and Crowdy failed to stop him, not having any pace, and got his horse cut below the hock: then there was a general melée and the gallant fight was over.

My pony had been caught and brought to me, so I was in at the death of my first pig! Not indeed mine by virtue of 'first spear', but had I not tickled him up with the shot gun? And how soon had I learnt that the prowess of the great grey boar was no whit exaggerated.

In those days ponies were cheap to buy, and keep, so I soon owned some useful nags. The Sonepore Fair, where to this day you may buy anything from an elephant to a mouse, or an eagle to a quail, was perhaps the greatest event of the year. There was a great gathering of the planting community from far and near, to enjoy the ten days of business and pleasure for all and sundry assembled from most parts of India.

Wandering around on an elephant, the camps and native quarters could be seen to great advantage. There were streets of shanties rigged up as shops for sale of all sorts of goods; groceries, toys, curios, various liquids in many-coloured bottles; silks, muslins, beds, tables, and every conceivable article of furniture; carriages, carts, conveyances of all sorts. Doubtless in these days there will be bicycles and motor cars; and soon there will be aeroplanes!

Beyond the tents was the horse fair to which dealers, even from far Afghanistan, brought animals of every quality for sale. Good, sound, nags could be had, but the buyer needed his wits about him for he was bargaining with some of the most astute horse-copers in the world.

It used to be a great sight to watch the many elephants being bathed in the waters of the Gandak, just as one sees them near Kandy in Ceylon and at other places at the present-day. Lying down in the water they are well scrubbed with a brick, then over on the other side, obedient as any child, and when that has been well cleaned, off to the sugarcane mart and away to camp for a feed for man and beast.

It was the Kabuli horses that we younger planters used to buy, they being cheap as well as strong and hardy: round about Rs. 200 is what they cost us. There was racing on four alternate days, with a ball kept up until a late hour in the same evenings; and the evening drive round the race course when all Sonepore used to put in an appearance; and the polo and tennis and endless jollifications: what a hectic time of it we lads used

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to have! I wonder if the great mango grove of a hundred acres is still as it used to be, affording welcome shade to the great concourse of canvas.

But let us get along to the best part of those days; the pig-sticking and hunting of jackal, wolf and fox. It would be wearisome to relate the happenings of many hunts, but there are incidents which stand out in the memory. One such was the day when an elephant was cut about a foot below the root of the tail! You would not think that possible? This was the way of it.

On the day of that memorable incident four spears were out, and a fifth man was on an elephant with a shot gun, for the ground to be beaten was covered in heavy thatching-grass. The line of beaters started a fine boar. He broke just under my pony's nose: we nearly trod on him. A real fighting pig he was, and we were unable to get him out of the grass. As he lay up and would not show himself the elephant was called up to push him out, but the pig turned the tables on the *hathi* for he instantly charged; and as the elephant turned tail gave him two good cuts on the leg. On receiving these hasteners the frightened elephant stumbled for some cause and half sat down—which was the pig's opportunity to give him a real swipe of a cut in a nice soft place! Our pal with the gun fell off, almost on top of the pig, but Crowdy near by covered the fallen warrior with a spear, so enabling him to get clear without damage. But the pig got home on C's horse and cut him badly in the hock; yet, even in that thick stuff, Crowdy managed to get in a mortal spear so that fighting boar died without a sound.

As we all know, the throwing of a spear is a very dangerous thing. An excitable member of our community twice did this when out with me. We were riding a small boar which had broken cover and made for some '*jhow*' in a river bed. Seeing the pig escaping into this G, old hand though he was, hurled his spear at the vanishing porker: the spear rebounded and cut the thigh of a cooly near by, for the turn of the hunt had taken us towards the beat. Fortunately it was not a serious wound, but it might have been.

That incident, however, was insufficient brake upon the excitable temperament of my friend, for a month later, when two nice boars broke and we were hard after them they jinked back and made for cover. We had cut out the larger of the two and were riding him for all we were worth, but the distance was too short. G stood up in his stirrups and hurled his spear at the disappearing pig; the spear point imbedded in the ground and G rode on to the leaden butt which caught him a heavy jolt over the liver. Lucky it was not the business end! He is not long gone to other hunting grounds, for he died about three years ago.

Pig-sticking risks are many and various. Buffalo wallows concealed in the long grass, the deep foot-marks dried in the fierce sun, were always a potential danger. One of us had a fall in one of these, and being spread-eagled in front of his mount,

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the spear still fast in his hand and the point backwards, speared the mare in the neck; a deep wound. As often as possible we used to have a Native Veterinary Assistant out with us and he was fortunately handy; so the wound was quickly seen to, and healed in about a month.

An accident which happened in Purneah, next country to ours, created a great stir at the time. G.-W and another, B, were riding a pig. B was on the pig and came down in the blind going. G.-W close behind saw this and tried to pull out, but his horse also came down and he was thrown on the point of B.'s spear which entered under the left breast and came out under the left shoulder blade. Instead of being instantly killed or mortally wounded, as one would imagine, no serious damage was done! The spear could not be pulled out from the front so was straightaway cut off close to the chest and pulled out from the back. Within a month the wounded man was fit and well, a most marvellous recovery from an apparently fatal wound. He rode pig afterwards and died twenty-five years later from causes unconnected with the injury.

One day, when we were all having a rest and a drink, with the half dozen beating elephants taking their ease a short distance behind us, there was a sudden uproar among the animals. A fine tusker, whose mahawat had left him for some purpose of his own, rushed at another, overthrew him by the unexpected assault, and savagely prodded him with his tusks, one of which penetrated deeply behind the elbow. The missing mahawat rushing up with a stick in his hand, belaboured the offender to the accompaniment of a fine vocabulary of abuse and actually beat him off in that way, while the other elephant attendants had been powerless to make the brute desist from his attack. The poor beast died a month later from his injury.

It is a common saying that 'where a pig can go a horse can go' and this is almost literally true; but sometimes it is not possible. The deep fissures of the parched alluvial soil, much of it very blind owing to high grass and scrub, were always dangerous, but it was surprising how seldom bad falls occurred over such ground. It was the pace that did *not* kill, for in speed lay safety for man and beast, as all who have experience well know. Sometimes horses used to be badly staked by the sliced tops of cut crops such as '*arhar*', castor oil, and the like; and on one occasion a horse lashing out at a pig tore off the tush which remained imbedded in the soft part of his heel!

Bees sometimes caused a complete dispersion of sportsmen and beaters, the unfortunate animals suffering much on such occasions as they were unable to dive into the thick foliage of some bush, or to cover vulnerable spots with a portion of clothing. Their only protection lay in maddened flight which sometimes extended to miles.

The vitality of the wild boar is extraordinary, and I once saw a pig take thirteen spears before succumbing without a sound. Of course a good spear in a fatal spot is speedily fatal—but every spear is not so delivered.

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There were two kinds of boar in our country, at least so we non-naturalist pig-stickers considered; and they had different dispositions, the grey being the more fierce and pugnacious. A vicious and implacable foe when roused he always showed better fight than the black variety which would sometimes utter a dying squeal, which the grey boar never did. The two differed much in the slope of the skull, that of the black pig being high over the frontal bone and not very deep in proportion to length while the grey boar had a skull not markedly high but long, and receding in proportion to height. The black boars grew to a great size and the grey were, on the whole, smaller and more slightly built animals. The young of the grey pig were striped at birth, whereas those of the black were unstriped and of uniform black colour.

With an incident which might have been a tragedy I will end these sketchy reminiscences. G and B were in one heat, and W and self on the other side of the cover. The boar headed for the railway embankment, G and B on his tail. The line being of recent construction was unfenced. W and I having followed on arrived as the pig was speeding up the slope. G was met as he topped the edge of the embankment by the charging pig and delivered a good spear, rolling the animal down into a borrow pit. Almost in the act of spearing a train thundered by within a few feet of the excited rider. What a mess there might have been!

Now let us sing the good old song. No heel taps!

I would like to sing, but, I am sorry to say, I cannot accurately give the words of 'The Great Grey Boar' and do not know where to find the correct version.

It is fitting to close with those lines of Lindsay Gordon's in 'The Sick Stockrider':—

> In these hours when life is ebbing, how those days when life was young
> Come back to us; how clearly I recall
> Even the yarns Jack Hall invented, and the songs Jem Roper sung;
> And where are now Jem Roper and Jack Hall?

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ON THE BIRDS OF THE KISHENGANGA VALLEY, KASHMIR.

BY

MAJOR R. S. P. BATES, M.B.O.U.

ITINERARY.

April 16. Arrived Domel (2,200 ft.) by the Abbottabad route.
" 18. Domel to Pateka (2,670 ft.). 15 miles.
" 19 to 21. Remained at Pateka.
" 22. Pateka to Dhanni (3,200 ft.). 10 miles.
" 23. Dhanni to Tithwal (3,487 ft.). 8 miles.
" 24. Remained at Tithwal.
" 25. Tithwal to Salkalla (4,500 ft.). 17 miles.
" 26 and 27. Remained at Salkalla.
" 28. Salkalla to Keran (4,990 ft.). 10 miles.
" 29 to May 6. Remained at Keran.
May 7. Keran to Reshna (5,900 ft.). 14 miles.
" 8. Reshna to Sharda (6,130 ft.). 13 miles.
" 9 and 10. Remained at Sharda.
" 11. Sharda to Kel (6,544 ft.). 14 miles.
" 12 and 13. Remained at Kel.
" 14. Kel to Janwai (6,906 ft.). 15 miles.
" 15 and 16. Remained at Janwai.
" 17. Janwai to Taobat (7,400 ft.). 14 miles.
" 18. Taobat to Badwan (Gurais) (7,900 ft.). 14 miles.
" 19. Remained at Badwan.
" 20. Badwan to Bagtor (7,700 ft.). 9 miles.
" 21 to 29. Remained at Bagtor.
" 30. Bagtor to Koragbal (8,400 ft.). 5 miles.
" 31. Koragbal over the Razdhainangan Pass (11,586 ft.) to Tragbal, and thence to Bandipur and Srinagar on June 1 and 2.

NARRATIVE.

Ornithologically the Kishenganga is little known for the simple reason that the easiest and usual way of exploring Kashmir's many valleys is to go direct to Srinagar to arrange kit, supplies, and transport and to commence explorations thence. The route from Srinagar to Gilgit certainly traverses the extreme upper end of the valley through Gurais, but the stretch of the Kishenganga flowing through that very beautiful district comprises but one twelfth of its length from the junction of the Tilel and Burzil streams to the river's confluence with the Jhelum at Domel.

My wife and I had always longed to see Gurais, so the idea of combining a visit there with a study of the Kishenganga's birds proved an irresistible attraction in spite of a number of disadvantages in the scheme, the main one being that I had to take my leave from April 15 to June 14. This I knew before we started to be, even in normal times, a good month too early for my purpose, but the weather in the first half of April this year was most unusually wet and cold. The result of course was to all

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intents and purposes that we were always moving up about three marches behind the snow level. In consequence practically none of the birds which I particularly wished to study and photograph, with the exception of three or four very early breeders, had begun to contemplate nidification. This made it almost impossible to separate residents from migrants and to determine exact breeding limits.

The itinerary given above will I trust give the reader some idea of our travels but it requires amplification.

We arrived at Tret on the evening of April 14 to hear that the Murree-Kohala road was entirely blocked by snow and landslides and certain to remain blocked for some days. The following morning we gloomily retraced our steps to Rawalpindi only to find that the road via Abbottabad was also breached five miles or so from Domel, but feeling that a possible walk of five miles could not be allowed to interfere with our programme, we set off forthwith and reached Garhi Habibullah the same evening. By next morning the road had been cleared, and in consequence we were soon at the Domel Dak bungalow. Alas! a telegram there intimated that servants and supplies coming down from Srinagar were held up indefinitely by further slips near Uri.

To enable a start to be made at the earliest possible moment, I went off to the Thesildar at Muzzaffarabad to arrange transport, either coolies or ponies. Ponies, I was informed, are not to be had in the lower Kishenganga. Mules are used but the Thesildar was not optimistic. The heavy rain had played havoc with the track—it can hardly be called a road—along the Kishenganga, and an important bridge across a side nullah had also been swept away. He arranged to send us 26 coolies which he said could not possibly be expected to turn up before 11 o'clock on the 18th. It being then the 16th, I banked on our kit arriving and fixed up accordingly.

The following morning a worried Zaildar called upon us. His object was apparently to dissuade us from attempting the journey upon which we had set our hearts. I think he was afraid for my wife, but he did not know her determination nor that she is undoubtedly surer of foot than I am. Besides, it is extraordinary what one can accomplish when the only alternative is to go back all the way one has come. There are few routes over the hills out of the Kishenganga Valley and they are almost impracticable until well on into May. According to the Zaildar the path was so awful that we might reach Tithwal, only three marches up the Valley, in a fortnight or three weeks. Actually we were there in less than a week but nevertheless he was right about the state of the track, and after those first three marches we both felt quite competent to take on any goat over ground of its own choosing.

Our kit fortunately turned up on the 17th, so by the following morning everything had been sorted out and repacked into fifty-pound coolie loads in time for the proposed start. The promised coolies did commence to appear roundabout 11 o'clock, but they were a very mixed crew. A good hour and a half was wasted

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wrangling over loads and it required a vigilant eye to see that each coolie had anything like a full one, added to which the coolies of these parts carry their loads unroped on their heads or shoulders instead of across their backs in a sensible manner. A string of gurgling camels would have been easier to deal with. It was long after midday before a start could be made.

The dak bungalow compound was seething with migrants. The previous day had seen the trees filled with Grey-headed Flycatchers and Willow-Warblers. The former had passed on but shimmering white streaks of beauty now proclaimed the place alive with Paradise Flycatchers, and just as we started a flock or five or six Black-throated Thrushes arrived, but whether the latter were bound up or down the valley I cannot say.

Birds seen at the beginning of this march were mainly those of the lower levels and plains including Jungle Crows, Common Mynas, White-cheeked Bulbuls, Drongos, Indian Bushchats, and by the river a couple of White-breasted Kingfishers, Himalayan Whistling Thrushes, many Plumbeous and White-capped Redstarts, and to my surprise on a patch of boulders a mile or so beyond Muzzaffarabad a Pied Chat. A second one was seen a little way further on.

A couple of miles or so from Domel the Kishenganga roars from a gorge of thoroughly impressive dimensions, and from there for over thirty miles to Tithwal it can be said with truth that the valley is but a narrow gash in the mountains with a precarious path scratched out on its flank, sometimes high above the seething water; sometimes, but not often, approaching nearer its surface. From Tithwal to Keran the hillsides are perhaps less precipitous; again a gorge to Dudhnial, but inclined to be more often slightly less enclosed from there to Gurais. But throughout its entire length the river has cut a series of deep gorges with occasional fans and flattened spurs where large side streams flow in. Here of course are the villages, usually consisting of but a few houses, the inhabitants of which eke out a precarious existence by terracing every available spot into narrow fields in which they grow maize, corn, and to a lesser extent rice, maize being to all intents and purposes the sole crop from Keran upwards, in spite of the fact that Keran is only 5,000 ft. above sea level. The severity of the zemindar's lot is reflected in their weather-beaten faces and ragged clothing, and certainly in the lower reaches they struck me as being an under-nourished meagre race. The coolies of the lower tracts were a poor lot after the sturdy Kashmiris, and a thirteen-mile march with a fifty-pound load took them all day to accomplish.

At the eighth mile from Domel, at Ghori, the river is spanned by a suspension bridge. As far as this the road, a ledge cut for the most part in the gorge side, was in an execrable condition but by no means impassable. Numerous slips had occurred with abrupt slides straight into the river beneath, and across these a path a foot or so wide had been trodden. The first few were unpleasant to negotiate but there were so many that we quickly got used to them. From Ghori to Pateka the path was on the

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left bank and crossed one or two spurs so was not so often abruptly over the river.

From Ghori too the country began to show a definite change. Bushes had certainly become more numerous and taller, but now open woods of long-leafed pines began to make their appearance on the southern bank, though these were mainly high up the mountain sides. It was not until the next march that the woods definitely grew down to the river's edge.

At Pateka I at once noticed Striated Swallows flying around the forest rest-house. We also heard Nightjars there but I failed to collect a specimen. They had the extraordinary habit of hawking insects at dusk high overhead well out of gunshot over the two stoney nullahs on either side of the hut. I failed to discover them in their daytime haunts and a nighttime expedition with an electric torch likewise drew blank.

From Pateka to Dhanni, a distance of but ten miles, took us all day, three coolies not getting in until nearly dark. First we had to negotiate a rushing torrent where the bridge had been destroyed, and shortly afterwards we were faced with a slip between three and four hundred yards wide where the whole hillside had literally fallen away. It was not as terrifyingly steep as it might have been, but rocks jutted out awkwardly in the worst places and slipping shale splinters made it necessary to go quickly for yards at a time, an unpleasant proceeding where the 'path' was but a series of imprints of coolies' naked feet. Our difficulties were further increased by our two dogs who would insist on trying to walk side by side. The cocker in one place developed cold feet and made an effort to get back along the path to his mistress past those who were leading.

At Dhanni Striated Swallows were again in plenty, so I did not add to the only specimen I had collected at Pateka, expecting to meet with them further on when building operations had commenced. Alas! we saw no more after entering the Tithwal gorge. 3,200 ft. seemed to be the limit of this race. I also ascertained that the Common Swallow was unknown in the valley. The Zaildar at Pateka was able to describe quite accurately the nesting of the Striated Swallow and told me they would have eggs in twenty days' time but said no Swallows ever built in the houses, and certainly I never saw one after leaving Domel.

Dhanni to Tithwal was an easy march, the latter half being through a very beautiful gorge. There were now a few trees on the right bank as well as scrub, and deodars with their graceful drooping boughs and symmetrical outlines made their appearance amongst the pines. Wild pear in blossom and some kind of fig tree also added their quota to the flora. Flocks of Blue Rock-Pigeons inhabited the craggy banks, and I was surprised to see a Large Cormorant wing its way swiftly down stream.

Tithwal, apparently usually called Karnah, was hot; the high hills enclosing it on all sides reflected the sun's rays as in a funnel, and we were pleased to quit it after a day's halt. There was an isolated colony of Common Mynas there and also a few House-Sparrows. No more of either were seen throughout the

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length and breadth of the valley until we again found the Sparrows in Gurais. It was here also that the last Paradise Flycatchers were noted, a single pair amongst some almond trees and one at Mirpur but a few miles further on.

At the entrance to the Tithwal Gorge I had an amusing hour or so trying to collect specimens of Alpine Swifts. They had their quarters in some crevices in a perpendicular cliff about forty yards above the path. A screaming band would literally hurtle past the crevices, one or two birds swinging upwards and rapidly creeping into a crack whence issued further chitterings. I regret to say that I expended ten cartridges without the least effect. The bands arrived over a little spur with such incredible speed that an aimed shot was an impossibility. I tried standing with the gun to my shoulder aiming at a favourite crack until I could stand the strain no longer when of course with a swish like a passing shell half a dozen birds would rush by. Browning being inffective I attempted to get birds as they crawled into one of the narrow cracks. Twice I succeeded in peppering one, but each time it just seemed to shake itself and crawl in the faster. The range was too great for No. 10 shot and dust from the .410 bore. I returned in the evening with 6's but alas they had already retired for the night.

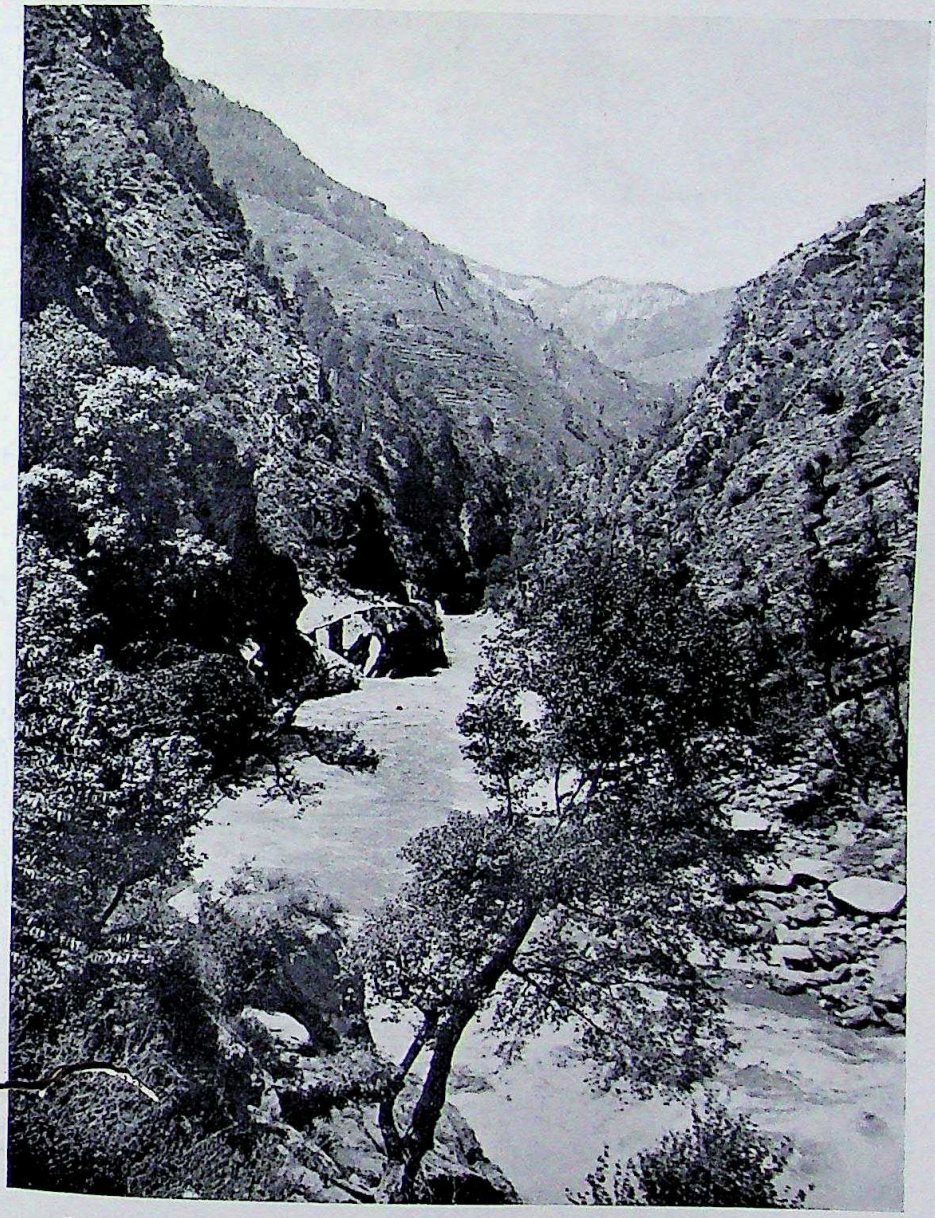
The next stage was a long one, approximately 17 miles to Salkalla. We arrived tired and thereby chose just about the worst camping ground we could have done. Next day we wondered how on earth we could have hit upon such a sandy spot when within two hundred yards was a comparatively grassy patch under a chenar quite close to the spring whence we drew our water.

Incidentally in three weeks we used the tents for as many days, so at Keran sent them back to Srinagar over the 10,000 ft. Pass which leads to Tregam and Sopor. Not only are there frequent forest rest-houses at convenient intervals all through except at Kel and at Taobat, but to find camping grounds anywhere along the whole length of the valley until one is nearly in Gurais is almost an impossibility. Where a flat space large enough to pitch a tent does occur, it is either incredibly dirty, having been well fouled by successive pack-mule caravans, or else it has been turned into a narrow field and consequently is either bearing a crop or in process of being ploughed up. I advise travellers to obtain permission to use the forest rest-houses—most of them have two rooms with just sufficient furniture—take one small tent for use in case of necessity and their own camp furniture. The us- of each room is only eight annas a day, so not only does one save coolies, who are not always easy to collect in the lower reaches, but one saves considerable expense into the bargain.

A further change was coming over the birds. The zwang-zwang-zwang of Stewart's Bunting faded out somewhere in the neighbourhood of Salkalla and the Meadow Bunting took its place. Blue Magpies became common, Black Bulbuls excessively so, and Turtle Doves appeared. Scaly-bellied Green Woodpeckers were by no means uncommon. In fact one had reached a new zone of bird life. Salkalla is only 4,500 ft. above sea level but its bird

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Entrance to the Tithwal Gorge. Alpine Swifts occupied crevices in the cliff face near the small bridge on the right.

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population appeared to correspond with about the 6,000 ft. level of such valleys as the Sind and Lidar off the main vale of Kashmir.

At Keran we stayed a week. We were overtaking the snow level which was then only three marches ahead. Keran itself had experienced a late fall on April 14 but it also appeared a good place for birds. The woods were thicker—deodar, long-leafed pine, horse chestnut and other trees on both sides of the river, and the Ilex growth scantier. The latter, which had been much in evidence from below Salkalla soon after disappeared altogether. There are also two big villages and a considerable crop area as a stream flows into the main river on each side. Chukar abounded on one slope. The Blue Magpie parties were breaking up into pairs: Pied Woodpeckers appeared, and altogether we had an interesting time.

Alas! few birds except Whistling Thrushes, Plumbeous Redstarts, and Brown Dippers, whose photographs I already have in plenty, had really got down to nesting, so bird photography was still at a discount, but the list of species noted soon swelled to the neighbourhood of ninety. The first Crested Black Tit and the first Simla Black Tit were noted, while Short-billed Minivets in large bands were most numerous. Pipits I still did not meet. In fact I had only seen one in the neighbourhood of Dhanni when I was without my gun.

The stretch from Keran to Sharda we did in two instead of the usual three marches, but the 14 miles to Reshna is better done in two stages, halting at Doarian where there is another F.R.H. Doarian to Reshna is decidedly hard going, the path having to ascend through the forest some hundreds of feet to surmount the towering cliffs of a narrow rocky gorge.

At Sharda I heard Thrushes singing a few hundred feet above the rest-house. They turned out to be Grey-headed Thrushes and were mating. I also saw here a Blue-headed Rock-Thrush for the first time and a Missel Thrush. The forest was thoroughly suitable for the Grey-headed Thrushes. Many chestnut trees, just unfolding their leaves, were growing amongst towering forest giants of deodars and silver and spruce firs, numbers of whose rotting trunks were strewn over the steep hillsides collecting drifts of melting snow against their slippery decaying sides. A thin, as yet leafless, parrottia scrub formed the undergrowth.

By the time we reached Kel on May 11, a further change had come about. The deodars had almost disappeared and the firs predominated, though long-leafed pines were again common. Unfortunately these close-growing fir forests which now persisted for the rest of our trek to Gurais contained little undergrowth, so a great many birds which prefer woods of a more mixed character were absent or rare. Wide snow drifts across every nullah and stream slowed up one's rate of march. On the south bank snow was still lying in the forest, and here I heard and saw the first and last Yellow-billed Choughs. 6,500 ft. is surely a very low altitude for these birds even in early May.

We had thoroughly bad luck at Kel, the one and only stage where no forest hut of any kind exists. Shortly after our arrival

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the temporary bridge over the Barai nullah, within three hundred yards of which we had pitched a tent on the roof of a deserted hut, was swept away, and we were let in for an enforced stay of three days. I regret now I did not climb the hill immediately behind our camp as I believe a good view of Nanga Parbat, but thirty-five miles away, is to be obtained from its summit.

Fortunately for us the lambardar of Kel was an enterprising soul and nobly turned out a stout band of villagers who, with the help of men from a small hamlet on the other side, threw a primitive cantilever pine-log bridge across a narrows. Unfortunately it entailed a detour of two miles up the nullah and an appalling scramble over snow shoots and the steepest of slopes before we were back on the path. Nevertheless we shall remember the lambardar of Kel with real gratitude.

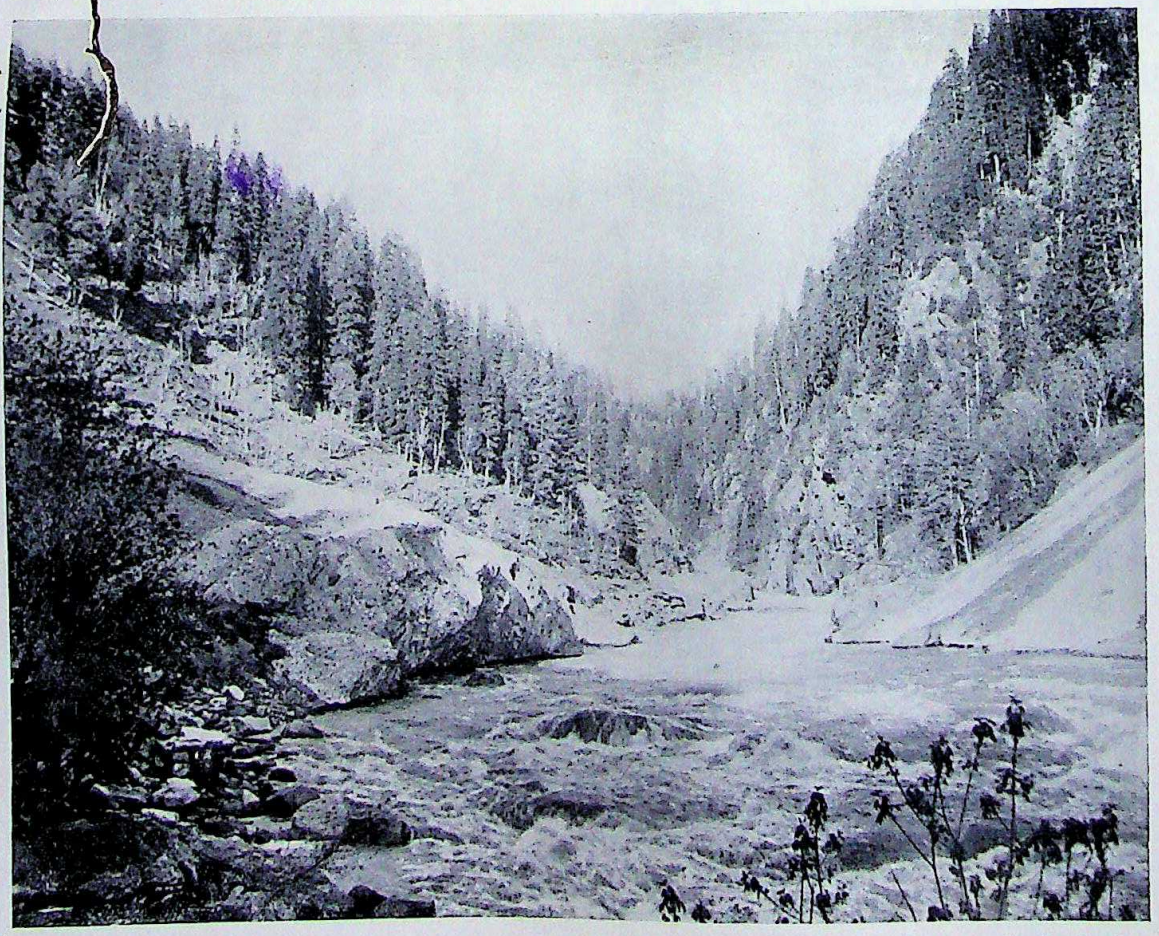
Our troubles as regards the path were now practically over. We still had a few tricky places to get across—one where a snow bridge had collapsed and we had to descend the stream between deep snow walls splashed by the iciest of waterfalls and crawl under the overhanging lip along the river edge, a by no means pleasant experience, and I for one heaved a sigh of relief when the last coolie was through, as a block of snow the size of a house looked ready to crack off at any moment.

We spent two full days at Janwai and then made for Taobat. Between Kel and Janwai the forest on both sides of the river was amazingly thick, but now, six or seven miles short of Taobat, the valley at last really did open out. The slopes still went up straight from the river but at a gentler angle. Villages and cultivation were more in evidence: one could actually see hilltops and margs. The fall of the river was less and the din of churned up seething mud-stained water diminished. It frequently widened out enclosing a few islands and at last the querulous twitterings of Sandpipers were frequently heard. I had seen but one or two of these birds all the way up and had come to the erroneous conclusion that the Kishenganga was not to be counted as one of their best loved routes from the plains. It was now, and only now, that we fully realised the extraordinary nature of the valley we had traversed. For 120 miles we had walked through fearsome gorges until we expected nothing else. At last we were in country more like that to be found in the better known valleys of Kashmir.

After a somewhat draughty and chilly night at Taobat as our shelter consisted of a large one-roomed hut with wooden barred openings on opposite sides for windows, a 'kuth' store, we went on to Gurais.

The river here takes a wide double bend between heights of 13,000 ft. or so and passing along this bend we could not help feeling that we were in a milder more hospitable clime. This seemed to be definitely true as I began to note again birds which we had left behind at considerably lower levels. At Bagtor Rufous-backed Shrikes re-appeared and at Gurais itself House-Sparrows outnumbered Cinnamon Tree-Sparrows by twenty to one, while Sandpipers became increasingly numerous.

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View near Kel. From here the fir forest became increasingly thick.

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But we were not impressed with Gurais. True the snow had hardly melted: flowers were practically non-existent, and the weather broke. Perhaps we had been expecting too much, but we had undoubtedly passed through much finer scenery. After a day's rest we therefore retraced our steps to the Bagtor F.R.H. two miles below Kunzalwan, charmingly situated on the edge of the forest on a sloping green marg still soaked with but recently melted snow, where bright blue gentians already starred the earth, and where irises were soon to cover the sward in wide patches. There we spent a thoroughly pleasant ten days from May 21 to May 30.

Migrants were still arriving. One day I suddenly realised that Sooty Flycatchers were about, hawking flies from the highest perches to which they would return again and again, while three days before we left I thought I heard a Blue Chat, soon confirmed as next day two were calling and thereafter they were everywhere.

On May 30 we left on the final stage to cross the Razdhainangan Pass and descend into the vale of Kashmir. There is little more to add. As we left Koragbal I heard the unmistakable five-noted call of the Large-billed Willow-Warbler and went on hearing it until we left the vicinity of the stream near Gorai. The pass was very trying. In spite of getting up at 4 a.m. in a sharp frost the snow was very soft and through it we had perforce to plod and slip and sink for nearly six miles before leaving it behind for good at the top of the Tragbal forest. A biting wind was blowing in our faces as we neared the crest and our toes were like blocks of ice but it was a perfect day and the views in all directions more perfect still.

As we trudged down the Tragbal forest I received ample confirmation of the rigour of the Kishenganga's climate compared with that of the vale of Kashmir and its immediate side valleys. Birds were much more numerous, the Meadow Buntings and many other birds obviously breeding freely, and below Tragbal the wild roses were glorious with many Hume's Lesser Whitethroats breeding amongst them. Nevertheless I soon ascertained that conditions really were abnormal everywhere, as after arrival in Srinagar my efforts to get at least a few photos of the water birds of the Dal Lake were quite abortive as the water was very deep and the birds I wanted only just commencing to build. As the Kishenganga from its very topography and climate is bound to be backward compared with the vale of Kashmir, it is not surprising therefore that I had found so few nests.

Notes.

The following condensed notes may be of use to others taking the same route:—

(1) Kashmir always experiences rainy weather in the first half of April. In a valley of the character of the Kishenganga, this is bound to result in frequent landslides rendering the path unfit for anything except lightly laden coolies.

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(2) Repairs to the path are only considered after the better weather has set in and the snow melted in the upper reaches, and take considerable time to effect.

(3) From approximately Sharda the danger from avalanches and landslips is not over even in normal times until well on into May. Thus

(4) one cannot count on being able to use animal transport until the beginning of June.

(5) The forests of the valley are divided into three divisions:

(*a*) Muzzaffarabad Division,
(*b*) Keran Division, and
(*c*) Sindh Division.

In order to use the forest rest-houses permission must be obtained from the respective Divisional Forest Officers whose offices are at Muzzaffarabad, Keran, and Bandipur.

(6) These F.R.H.'s have furniture, including bathroom utensils, with the exception of Janwai F.R.H. which had nothing.

(7) There are no F.R.H.s at Kel and Taobat, but at the latter place is a large one-roomed shed which may be used. There is of course no cook-house or servants' quarter along with it. The Bagtor F.R.H. is 5½ miles further on but this makes it a twenty-mile march from Janwai—not impossible of course provided the path has been repaired and one can use ponies as the going is good except over one or two short stretches.

(7) Tentage may be used in place of going to the rest-houses but places to pitch them are difficult to find until after Janwai, the only available ground often being in the F.R.H. compounds.

(8) Milk, eggs, chickens, and sheep are obtainable. Butter is not good and the sheep are miserably thin as the grass is of scant growth until June. Vegetables are quite unprocurable with the exception of dandelion leaves which make quite presentable spinach.

(9) The time of year to undertake the trip is rather difficult to advise upon, as the lower end of the valley warms up very quickly. Even on April 24 we found Tithwal decidedly hot. But if one starts too early one overtakes the melting snows and finds the path frequently blocked or damaged. Personally I would advise starting in the first week of May and moving up more slowly than we did.

(10) Should one wish to strike into the valley instead of starting from Domel, there are three good passes leading from Kamraj or the Lolab to Tithwal, Keran, and Dudhnial. These are not likley to be practicable for ponies until well on into May or even early June.

Systematic List.

(1) **Corvus macrorhynchus intermedius.**—Jungle Crows were common all along the line of march and were noted to be building in April; namely at Dhanni on April 22, near Tithwal carrying lining material on April 23, and at Salkalla on April 27.

(2) **Corvus splendens.**—House-Crows were totally absent from the valley. Villages like Tithwal and Keran might have been expected to harbour colonies of this crow but the last I saw were near Abbottabad in Hazara.

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(3) **Corvus monedula.**—This bird also has really no place here as it was never met with. A pair were however seen not far from Garhi Habibullah in Hazara shortly before crossing over into the Kishenganga Valley.

(4) **Urocissa flavirostris cucullata.**—These beautiful birds were very commonly met with in the lower parts of the valley, the last, a party of three, being seen a couple of miles beyond Dudhnial at an elevation of approximately 6,000 ft. on May 8. More often than not they were in small flocks but single pairs were not infrequently met with. For instance, we had two pairs near us at Keran occupying territory on either side of the Rest-House. Stuart Baker, *F.B.I.*, 2nd Edition, vol. i, remarks that they haunt principally evergreen forests and heavy jungle. I would rather put it that they haunt the outskirts of evergreen forest and heavy jungle, seldom if ever being found far within the latter, unless well provided with glades dotted with trees and tall bushes. They often visit cultivation where it lies close to forest, and I have not infrequently seen them hopping about ploughed fields in a most ungainly manner.

(5) **Garrulus lanceolatus.**—On April 26 I procured a female which flew across a small patch of cultivation into some light mixed forest by the river side at Salkalla. The ovary was slightly developed, having a granular appearance. A pair was seen in similar country three miles from Salkalla on April 28 during the march to Keran.

(6) **Nucifraga multipunctata.**—A single bird was seen at Keran on April 30 on the edge of the forest by the F.R.H.

(7) **Pyrrhocorax graculus.**—A party consisting of some thirty birds was seen on May 12 at Kel. Taking advantage of the air currents they circled rapidly up a rather bare steep nullah behind our camp and were soon lost to view. None was seen elsewhere, not even during our crossing of the Razdhainangan Pass.

(8) **Parus major cashmirensis.**—Very common as far as Sharda after which they became progressively scarcer until the last one was seen and shot on May 17 five miles beyond Janwai at an elevation of 7,200 ft. At Keran at the beginning of May they appeared mostly to be concerned with searching for nesting sites, but the specimen procured near Janwai proved to be a breeding male.

(9) **Parus monticolus monticolus.**—A single pair was remarked at Keran on May 3 in some mixed forest about 300 ft. above the F.R.H. They were not uncommon at Sharda.

(10) **Lophophanes melanolophus.**—First noted in the Keran Forest at 5,300 ft. on May 1. Thereafter it was met with at each halt to Bagtor. The next species, however, seemed to be the common Black Tit of the Kishenganga.

(11) **Lophophanes rufonuchalis rufonuchalis.**—Also first seen at Keran, on May 5, where it was undoubtedly more numerous than *melanolophus*. It was in fact the commonest Tit seen from there right up to Gurais, and most of the Black Tits on which I levelled my glasses turned out to be of this species. A pair was watched inspecting holes in the ground for a nesting site in the forest on the edge of the path near Kunzalwan on May 18. I am quite convinced that numbers of 'Black Tits' nests taken from holes in the ground in the forests of the Kashmir valleys and recorded as *melanolophus* are in reality those of *rufonuchalis* and that the bird is much commoner throughout Kashmir than it is recorded to be. I am sure that I have unfortunately been guilty of the error myself. The two birds are not very easy to differentiate except at the closest range with glasses.

(12) **Sitta leucopsis.**—Marching back to Bagtor from Badwan on May 20, I heard a very harsh call issuing from the summit of a tall spruce fir. Two birds of the size and shape of Nuthatches flew out and across the path into the thick forest on our left. Judging from their notes I consider they must have been of this species. They were the only Nuthatches seen throughout the valley.

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(13) **Trochalopteron lineatum lineatum.**—Evidently a common bird throughout the valley wherever ground suited to its requirements occurs. Although an arrant skulker it does not mind leaving cover if undisturbed. A pair haunted the compound of the F.R.H. at Tithwal although it could boast of but three bushes capable of affording any protection from view. Near Sharda I saw one out in the middle of a ploughed field, while at Bagtor one was actually noted sitting on the roof of a house. It only shuffled away when I approached and levelled the glasses in its direction. They possess a very plaintive unmistakable three-noted danger call of 'twee-twee-twee'. Two males shot at Pateka on April 20, which I had taken for a paired couple, had the testes enlarged to the size of peas but a search for a nest only produced a last year's one.

(14) **Microscelis psaroides psaroides.**—From Muzzaffarabad, where I saw a pair in the trees of a cemetery just before getting into the gorge, to Keran (5,000 ft.) these birds became increasingly common. I saw a pair at Reshna (5,900 ft.), 13 miles further on, but none after that, although I thought I heard their harsh notes once at Sharda but may have been mistaken.

(15) **Molpastes leucogenys leucogenys.**—Common as far as Tithwal. I noted one or two at Salkalla (4,500 ft.) but none beyond.

(16) **Certhia himalayana limes.**—The first Tree Creeper was noted at Pateka on April 24. This bird, a female, was not in breeding trim. Others were seen at Keran, Janwai, Bagtor, and Badwan. At Bagtor they were very numerous. A male shot at Janwai on May 16 had the testes greatly enlarged. Hodgson's Tree-Creeper was not noted.

(17) **Troglodytes troglodytes neglectus.**—I did not come across this cheerful little songster until I had climbed to about the 8,500 ft. level into a rocky rather gloomy patch of forest in the Gishat nullah at Bagtor on May 24. I heard them again after passing Gorai on the way up to the Razdhainangan.

(18) **Cinclus pallasii tenuirostris.**—Exceedingly common along the river, and its side streams, over its whole length. Young birds strong on the wing were seen from Pateka in April to Badwan and Bagtor at the end of May. One bird was observed sitting, presumably on eggs, in an inaccessible nest at Tithwal on April 24. Although undoubtedly an exceedingly early breeder, the nesting of this bird is very prolonged, to a certain extent depending on elevation. I have seen young ones in the nest at between eight and nine thousand feet in the Lidar Valley as late as August.

(19) **Tarsiger brunnea.**—This bird only put in its first appearance on May 28 when I recorded that I thought I heard its notes once in the Gishat nullah at Bagtor. I had ample confirmation next day when I heard two at once on either side of the F.R.H. Thereafter they became increasingly numerous.

(20) **Saxicola caprata bicolor.**—Not uncommon at Domel and seen again at Pateka between April 18 and 21.

(21) **Saxicola torquata indica.**—Common throughout the valley. Signs of breeding were noted from the end of the first week in May.

(22) **Rhodophila ferrea ferrea.**— Common at both Domel and Pateka. None seen further up the valley.

(23) **Œnanthe picata.**—On April 18 I saw one of these birds on a stoney patch just opposite the old fort at Muzzaffarabad and another one a little further on, likewise amongst stones and boulders.

(24) **Enicurus maculatus maculatus.**—Noted at Keran and Sharda on May 1 and 10 respectively. From their behaviour I am sure the Keran pair had a nest but I failed to locate it. This bird is probably much commoner in the Kishenganga than it appeared to be but I visited few streams suitable to its habits, except at Bagtor, where, however, I never came across it.

(25) **Microcichla scouleri scouleri.**—Generally connected with mountain torrents in the steepest of nullahs well provided with waterfalls where this little bird can play about in the spray. At the Gehl nullah between Tithwal and Salkalla

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on April 25, one was seen right underneath a voluminous fall and another in a typical situation at Janwai on May 14, but two miles beyond Dudhnial, where the river for once flows serenely between wide banks, I was surprised to see a Little Forktail pottering around a boulder some ten yards out from the near bank. We did not pass a side stream for another quarter of a mile. This was choked with snow and had very little water in it.

(26) **Phoenicurus frontalis.**—One was noted in Gurais on May 19 feeding in a patch of viburnum near Wampur village.

(27) **Chaimarrornis leucocephala.**—Common everywhere along the main river and also to be seen on the larger streams. In my opinion the majority of these Redstarts breed late, from the end of June, and move up very leisurely from the lower winter levels to their breeding grounds in the neighbourhood of eight or nine thousand feet upwards. A male, shot at Bagtor on May 23, had the testes greatly enlarged and appeared to be breeding.

(28) **Rhyacornis fuliginosa fuliginosa.**—As common along the whole length of the Kishenganga as along the other Kashmir rivers. I noted no signs of nest building until we were at Keran at the end of April. From the beginning of May many pairs had commenced nidification, and at Bagtor on May 27, the only time I really searched for them, I found nests both being built and containing fresh eggs.

(29) **Calliope pectoralis pectoralis.**—The first one seen was feeding in some viburnum bushes twenty yards from the Bagtor F.R.H. on May 29. It was a male with organs developing and may have been driven down from higher levels by the stormy weather we had experienced on that and the two previous days. The next one I saw was sitting unconcernedly on a stone by the broken bridge near the remains of the Gorai dak bungalow.

(30) **Ianthia cyanura pallidiora.**—First noticed near Badwan on May 20, but on our return to Bagtor I found them very common there, often coming out into the viburnum shrubs running along the edge of the forest. On May 21 I shot what I thought was a female, only to find it was a male in immature plumage with testes well enlarged. A second one in full plumage shot the next day appeared to be hardly contemplating breeding.

(31) **Copsychus saularis saularis.**—As usual there was a pair in the Domel dak bungalow compound, and I saw one by the roadside as we passed through Muzzaffarabad.

(32) **Turdus boulboul.**—A dark unicoloured Thrush with an orange bill, which I took to be a female of this species, was seen quietly feeding on the ground in a small bagh three miles from Pateka on April 22.

(33) **Turdus rubrocanus rubrocanus.**—Only met with at Sharda, May 8 to 10, although a fine song heard near Gorai at 9,000 ft. on our way to the Razdhainangan Pass on May 31 was attributed to this species, as well as a number of old nests on the edge of the fir forest at Bagtor. At Sharda it was common above the rest-house and a male shot there had its testes greatly enlarged. They appeared to be mating as no less than five were seen at once chasing one another about the wood to an accompaniment of much cackling. As already stated the forest here was most suitable for them. After Sharda it was composed mostly of silver fir and spruce and was very thick and lacking in undergrowth.

(34) **Turdus atrogularis.**—A party of these Thrushes flew into the tall trees in the Domel dak bungalow compound just as we were preparing to leave on April 18.

(35) **Turdus unicolor.**— Only noted at Keran where I shot a male with greatly enlarged testes out of a pair which flew over the F.R.H. on May 3. Another bird was seen on the Nilam plateau near Keran two days later.

(36) **Arceuthornis viscivorus bonapartei.**—One seen at Sharda on May 9 and another at Janwai on May 16.

(37) **Monticola cinclorhyncha.**— First recorded at Sharda where I saw a male on May 10 when watching the Grey-headed Thrushes. I heard the song on

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several occasions during the remaining marches to Gurais and found them to be fairly common at Bagtor. I spent two whole days towards the latter end of May looking for their nests but without success. The pleasant though rather monotonous song of the male, so often rendered from the very pinnacle of a pine or fir tree, renders this bird easily traceable.

(38) **Myophonus caeruleus temminckii.**—Common everywhere and numbers had nests even from the date of our arrival in Domel, although I think few birds were then at the stage of incubating eggs but merely building. On May 11 between Sharda and Kel I observed three nests on ledges of the steep rock face of the further bank of the river within less than fifty yards of one another. On two of them birds were sitting. The other nest was visited twice. At Janwai there was a nest with three fresh eggs in it on a rafter of the F.R.H. verandah, while at Taobat one had actually built on a beam inside the shed in which we spent the night.

(39) **Prunella strophiata jerdoni.**—A male was singing on a branch just over our heads shortly after we got into the forest at Gorai (9,000 ft.) on May 31. It was obviously breeding, its testes being very greatly enlarged.

(40) **Hemichelidon sibirica gulmergi.**—I only became aware of the presence of these birds after we had been at Bagtor some days, that is on May 25, when I came on quite a party near the mouth of the Shalput nullah. One pair appeared to be building near the end of a branch high up in a fir tree. They have a very characteristic habit of hawking insects from a high perch to which they often return. After the date in question I saw many even around the F.R.H. They were very numerous at Koraghal in some birch trees on the evening of May 30.

(41) **Muscicapula superciliaris superciliaris.**—First noted at Salkalla. They were common at Keran where I watched a pair on April 30 fussing around a crack in an old split trunk. Both birds entered the cavity repeatedly although I was but four feet away. They eventually rejected it as a possible nesting site. I saw none beyond Reshna.

(42) **Eumyias thalassima thalassima.**—One pair observed by a small stream on a bush-covered hillside at Pateka on April 20.

(43) **Alseonax ruficaudus.**—I first met with this rather unobtrusive Fly-catcher at Keran. It may occur lower down the valley but until I had shot one I was not conversant with its notes and may have missed it. They were exceedingly common and breeding around Bagtor. Incidentally I found no trace of the occurrence of latirostris.

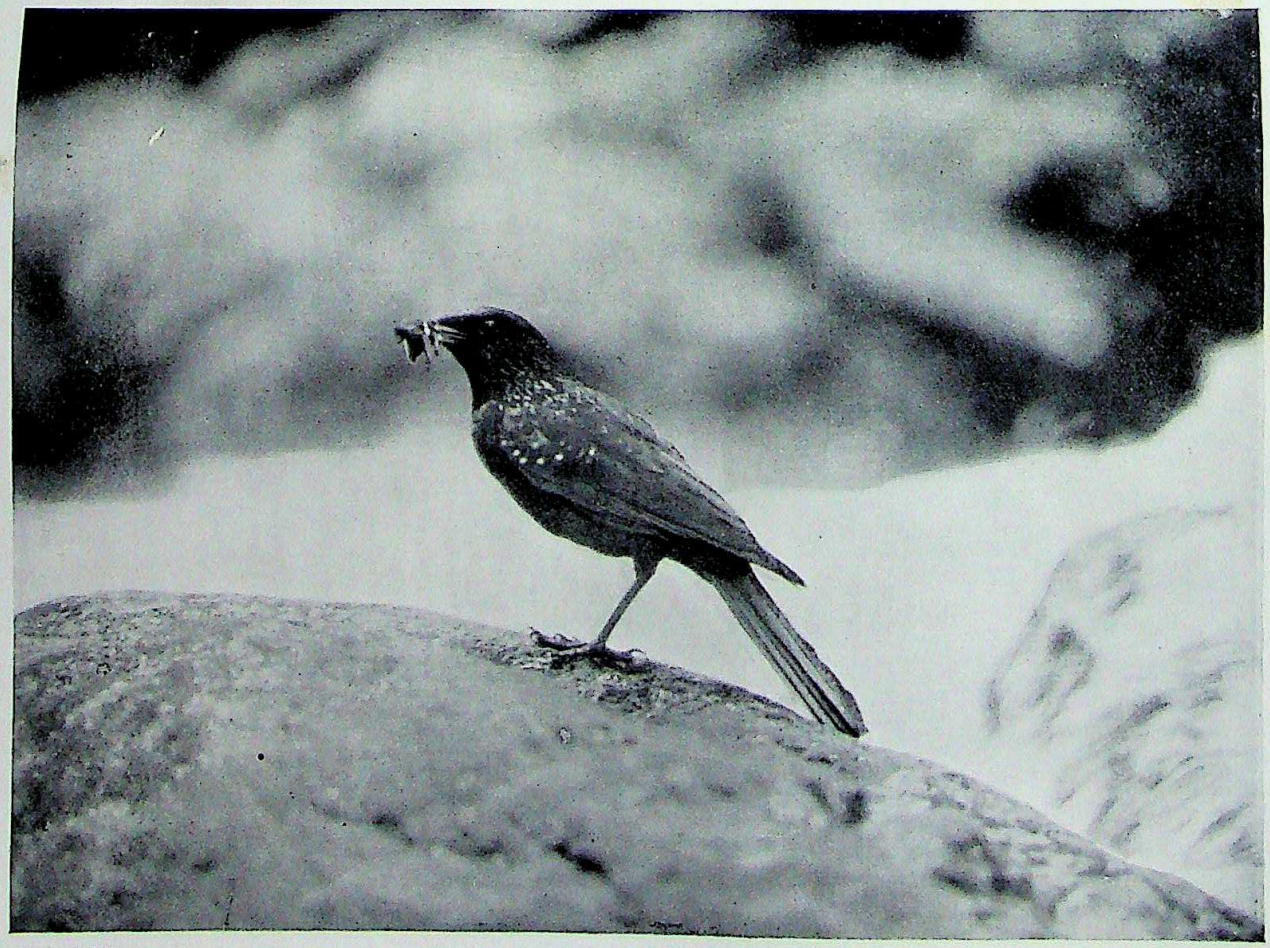
(44) **Culicicapa ceylonensis pallidior.**—The trees of the Dak bungalow compound were full of these flycatchers all through the day of our arrival at Domel, April 16. The following day they had passed on; apparently up the Jhelum valley as only at Keran on April 29 did I hear the unmistakable notes of a single bird.

(45) **Niltava sundara whistleri.**—Seen in the Domel Dak bungalow compound on both April 17 and 18, possibly the same bird both times.

(46) **Tchitrea paradisi leucogaster.**—Numbers of these beautiful birds passed through Domel the day after our arrival there, April 17. I don't think I have ever seen so many as I did at Pateka during our three days' halt at that place from April 19 to 21. Nevertheless I only saw one pair at Tithwal (April 24) in some almond trees and a single bird five miles further up at Mirpur, elevation 3,700 ft., on April 25. I quite expected to see them at Keran but none had appeared when we left on May 7. In fact this striking bird seemed to be unknown to villagers I questioned around Keran. Between Dusut and Sharda, 6,130 ft., there are many little orchards of cherry and apple trees as the valley is somewhat wider but this is perhaps a little too high for them to penetrate to.

(47) **Lanius vittatus.**— A single bird attributable to this species was seen at the edge of a small copse between Tithwal and Salkalla at about 4,000 ft. on April 25.

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Myophonus coeruleus temminckii on the way to its nest.

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(48) **Lanius schach erythronotus.**— Common at Pateka. We had a pair in the F.R.H. compound. I then saw them at Keran on the little plateau on which Nilam village stands, the elevation being about 5,400 ft., and shot a breeding male there on May 5. After that none was seen until we were passing through Bagtor where the river makes its abrupt turn into the wider milder Gurais valley. They were not uncommon in Gurais.

(49) **Pericrocotus brevirostris brevirostris.**—Noted immediately on our arrival in Keran where they were commonly seen in flocks of considerable size feeding through the forest often descending into the parrottia scrub. A male shot there on April 29 had the organs only slightly developed. They were common enough right up to Gurais, but from Keran onwards the flocks appeared to be breaking up into pairs.

(50) **Dicrurus macrocercus albirictus.**— Became increasingly common as we approached Keran. At that place a pair near the F.R.H. were most aggressive and may have already been breeding. I have no records of any seen after Keran.

(51) **Sylvia althæa.**— On May 1, I shot the male out of a pair seen in the viburnum and rose bushes on the edge of the Nilam plateau near Keran. Its testes were enlarging. It appeared very suitable ground for them and they may well breed there. I saw them nowhere else.

(52) **Phylloscopus affinis.**—A small party of these diminutive but hardy warblers was noted on passage at Pateka on April 19.

(53) **Acanthopneuste magnirostris.**—The characteristic five-noted call of this Willow-Warbler was not heard until we were leaving Koragbal in the small hours of the morning of May 31. I heard them frequently as far as Gorai where we left the vicinity of the stream. A few days before leaving Bagtor I had noticed that a very plain-coloured Willow-Warbler had appeared in small numbers in the Shalput nullah. This bird, which was then silent, fed largely in low bushes and close to the ground on weedy grass-covered banks along the stream. A specimen, a male with testes enlarging, shot on May 25 in this nullah, turns out to be *magnirostris*.

(54) **Acanthopneuste occipitalis occipitalis.**— Noted commonly throughout the valley. In April in the lower reaches they were probably only on passage. But at Keran in early May I began to hear their plaintive danger call.

The commonest Willow-Warbler of all, especially in the fir forest zone, was a small yellow-rumped bird, almost certainly *Phylloscopus proregulus*. So many Willow-Warblers were only passing through that I shot none of this species intending only to procure specimens actually nesting. I rather suspect that this bird is a late breeder and none seemed to have commenced nidification when we left the valley.

(55) **Homochlamys pallidus pallidus.**—This little bird of the intriguing voice was heard at Pateka, Salkalla, and Keran, in all of which places it appeared to be fairly prevalent. Keran being but five thousand feet above sea level I expected to meet with it much further up the valley, but, although the hillsides on the north bank of the river at Sharda looked ideal for it, I never heard it there. Is its range in the Kishenganga very restricted or did we pass it at Keran moving up the valley even more slowly than we were doing?

(56) **Suya criniger criniger.**— Common at Pateka; heard again near Dhanni, and one seen on a bushy hillside at Keran at about 5,400 ft. A male shot at Pateka on April 19 in the thick bushes just by the F.R.H. showed that breeding was about to commence. Incidentally it seemed to be a well known bird there and had the local name of *phitta*.

(57) **Regulus regulus himalayensis.**— The only one recorded was seen in the fir forest in the Shalput nullah near Bagtor at about 7,600 ft. on May 22. Unfortunately I blew it practically to pieces. Its testes were enormous and very pulpy but I could find no nest.

(58) **Oriolus oriolus kundoo.**— A single bird flew across the river four miles from Pateka during the march to Dhanni on April 22.

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(59) **Acridotheres tristis tristis.**—Common enough at Domel but met with them nowhere in the valley except at Tithwal where there is an isolated colony. I presume they must have worked their way from Kamraj over the comparatively low passes at the head of the Kazinag nullah.

(60) **Perrisospiza icterioides icterioides.**—On April 29 a flock flew past the F.R.H. at Keran and I heard their pleasant notes in the neighbouring forest for some time. I next met with this finch at Bagtor on May 24 and subsequent days, when I often heard and saw a small flock feeding through the forest above the rest-house. I also heard them in the Gishat nullah. On May 30 I saw some in the trees above the Koragbal Dak Bungalow shortly after our arrival there, and on the following day others were noted in the Gorai forest at about 9,000 ft.

(61) **Callacanthis burtoni.**—A single pair flew off the path between Badwan and Kunzalwan (7,800 ft.) on May 20 and as usual sat still and unperturbed on a rock quite close to us at the edge of the forest to let us go by before resuming feeding. I shot the female in the hopes of obtaining an oviduct egg but the ovary only contained yolks about the size of pin-heads.

(62) **Passer domesticus parkini.**—Only met with at Tithwal and in Gurais. Nowhere else in the valley. In Gurais they were very common, outnumbering the Cinnamon Tree Sparrows by about twenty to one.

(63) **Passer rutilans cinnamomeus.**—First noted three miles beyond Dhanni on April 23. This would be at an elevation of approximately 3,250 ft. They were common thence right up the valley though at Tithwal the birds in and around the village were *Passer domesticus*. Again in Gurais they seemed comparatively scarce where *domesticus* was once again very much in evidence.

(64) **Emberiza stewarti.**—Exceedingly common as far as Tithwal. Somewhere in the neighbourhood of Salkalla (4,500 ft.) they gave place to the Meadow Bunting, the latter being alone noted at Keran. A male shot out of a party at Pateka on April 19 had the testes only very slightly enlarged.

(65) **Emberiza cia stracheyi.**—Meadow Buntings were first definitely identified at Keran whence they were common all along the valley. The organs of a male and of a female procured on May 1 at Keran showed only slight development; those of a male shot at Janwai on May 16 were practically normal, but those of another male obtained at Bagtor on May 21 were considerably enlarged. Nest-building was first observed at Bagtor on May 24. As usual the ranges of *stewarti* and *cia* did not appear to overlap. Coming down the Tragbal forest it was also observed that the White-capped Buntings commenced where the Meadow Buntings ceased.

(66) **Melophus melanicterus.**—A male was noted as we crossed a small cultivated spur four miles from Pateka on April 22. On our way down from Srinagar on June 12, I noticed they were common from Garhi downwards.

(67) **Delichon cashmeriensis.**—I was particularly on the look-out for Martins, but in spite of passing excellent country between Kel and Janwai none was seen until May 25 and the following day when a party appeared out of the Shalput nullah at Bagtor. They were feeding over the marg high up with a party of Swifts, but after a time a band came fairly close and I brought one down with a lucky shot. Shortly afterwards the whole party returned whence they had come. From the map the only likely nesting place seemed to be near the mouth of the nullah but through the glasses I could make out no suitable cliffs or rocks.

(68) **Hirundo rustica rustica.**—Although seen at Domel, and I imagine large numbers must pass up the Jhelum, the Swallow was not seen and is apparently unknown in the valley. Many of the houses are constructed as in the vale of Kashmir but enquiries at Pateka elicited the fact that no Swallows built in the houses although the nesting of the Striated Swallow, which they called *phairni*, seemed to be well known to everyone.

(69) **Hirundo daurica scullii.**—The moment I went out of the hut the morning after our arrival at Pateka (April 19) I noted a pair of Striated Swallows flying round the compound. The zaildar, who called the bird *phairni*, said

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they would have eggs in about twenty days' time. On the strength of this, as I hoped to procure specimens at the nest, I only shot one, a male with testes the size of lentils. The following day half a dozen birds were about and often rested on the rafters of the verandah. I examined likely nesting places in the adjacent nullahs but could find no signs. In fact the only time I came on a nest was on the remains of an old one halfway between Dhanni and Tithwal, elevation approximately 3,000 ft. At the Dhanni rest-house the eaves were also being used by these birds, and as far as the Tithwal gorge I noted them at times as we marched along. It was most disappointing therefore to find that they no longer occurred at Tithwal. 3,200 ft. seemed to be their limit.

On the journey down from Srinagar on June 12 I first noted one of these birds at the 37th mile from Kohalla. The elevation marked on the milestone was 2,860 ft. I saw them all the way to Kohalla, particularly about Domel, and even after we had left the Jhelum and climbed a thousand feet or so towards Murree I noticed odd birds. Two nests were also observed, one crumbling, the other new looking, on rocks overhanging the road near the 29th milestone.

(70) **Motacilla alboides.**—Pied Wagtails were very common in the lower reaches of the valley in April, both grey and black backed birds being noted in numbers feeding in ricefields and other wet patches. These birds were probably on passage. In May as we approached the upper reaches of the river I came to the conclusion that I was only observing Hodgson's Pied Wagtails which were then to be found in pairs at rather wide intervals. As I was particularly keen on collecting only those birds which I knew to be actually breeding, I collected no specimens as I found no nest, nor did I observe any birds even carrying building material.

(71) **Motacilla cinerea caspica.**—Grey Wagtails were very common throughout. Their vanguard is certainly early on to the breeding grounds at the lower elevations, and even in April intruders were very rapidly 'seen off' occupied territory. Nevertheless nesting activity was hardly noticed before the march from Janwai on May 17, during which I saw no fewer than three separate birds carrying building material.

(72) **Anthus roseatus.**—With the exception of a single bird seen in some cultivation on one of the first marches, which I failed to procure, I saw no Pipits until Kel was reached. Here was a stretch of very damp grazing ground on which Pipits abounded. Two obtained on May 13 proved to be females with the ovaries but slightly developed. Suitable grassy ground of the same description seven miles short of Taobat, at Taobat, Bagtor, and Gurais supported many of these same Pipits. The state of the organs of two males shot at Bagtor on May 27 showed that breeding was imminent. I also noted them at this place on much drier ground and even in newly-ploughed fields.

(73) **Alauda gulgula thamorum.**—Neither heard nor seen until we first passed through Bagtor on May 18. They were common there and in Gurais. I found them feeding in small flocks on the grassy margs and amongst new plough, but a male shot on May 27 had the testes greatly enlarged, while two females had a few yolks measuring an eighth of an inch in diameter.

(74) **Zosterops palpebrosa occidentis.**—Flocks were noted from Domel to Keran wherever there were groves of leafy trees or bushes. The last were seen feeding in viburnum and other low bushes on the Nilam plateau (5,400 ft.) a mile or so beyond Keran on May 5.

(75) **Leptocoma asiatica.**—Evidently not uncommon at Domel as I saw two pairs in the course of an evening stroll on April 17. One pair was also seen twice at Pateka on April 18 and 19 in some bushes at the edge of cultivation about a mile from the F.R.H.

(76) **Picus squamatus squamatus.**—The loud call of this species first attracted my attention on our arrival at Salkalla on April 25, where I found it to be somewhat common in the open mixed forest and around clearings. It was common at Keran and I also noted it at Sharda, but it was not seen after leaving the latter place.

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(77) **Dryobates himalayensis albescens.**—This Woodpecker was not recorded until we reached the 5,000-foot level at Keran where it was somewhat common. From Keran onwards it was noted at every halt to Gurais, but was scarce in the thick spruce and fir forests. I have always noticed that this Woodpecker has an undoubted predilection for chestnut trees and where these occur five out of every six nest holes will be bored in them. The thick fir forests from Kel upwards, containing but few trees of other species, consequently held but a limited number of Woodpeckers.

(78) **Dryobates brunnifrons.**—While searching for *Dryobates macei* at Pateka, with which I never met incidentally, on April 20 I shot a male of this species with testes developing, approximately $\frac{1}{10}$ inch in length, which was searching the trunks of an open wood of long-leafed pines in company with its mate. On arrival in Srinagar on June 2, I was surprised to see a pair of these Woodpeckers in the Chenar Bagh on one of the poles carrying the electric mains. They were most amazingly tame.

(79) **Iynx torquilla japonica.**—Shot one at Keran in mistake for another bird when it was feeding by the side of a small bush. Its stomach was filled with a large number of small red ants which accounts for its presence on the ground. It was a male with testes slightly enlarged. I observed this bird to be common at Kel, and also at Bagtor where I heard its call from three directions at the same time as we were passing through on May 18.

(80) **Cuculus canorus.**—Not common. It was first heard at Sharda between May 8 and 10, but only in the one locality. Near Kel on May 14 one flew across the path in front of us. At Bagtor up to the date of our departure I heard the call not infrequently from two directions. On crossing the Razdhainangan pass however and dropping into the Tragbal forest, it immediately became very common.

(81) **Cuculus optatus.**—Heard at Bagtor between May 20 and 29, but only occasionally. One appeared to have its territory in the forest around Izmarg between Bagtor and Kunzalwan, and another to the west of the forest rest-house.

(82) **Psittacula himalayana himalayana.**—Slaty-headed Paroquets were met with from the commencement of the trek and were last seen near Dudhnial at approximately 6,000 ft. on May 5. My wife aptly likened their screams when flying about in bands to the whistlings of marmots on a more subdued scale. A pair which seemed to have a nest behind the Keran bungalow, were also heard to produce some very pleasant soft notes, the screams being generally resorted to on the wing. A number of somewhat large elliptical holes with the axis horizontal, which I thought might have been made by this species, were noted at Keran and one or two other places about there, generally near the very summit of tall dead trunks standing in forest.

(83) **Ceryle lugubris guttulata.**—Nest holes of this fine bird were seen at the Ghori suspension bridge in the bank of the main river, where I was told the bird breeds regularly, near Mirpur, at Salkalla, and at Keran. At Salkalla on April 27 I surprised the birds during tunnelling operations. The hole they were boring was a yard from an abandoned hole three feet deep in the wall of a sandy recess on the inner side of the path where it runs close to the water's edge a mile below Salkalla. When first noted the previous day the new hole was under a foot deep, but in twenty hours another three and a half feet of sand had been excavated. Incidentally I saw no nest holes or birds on the side streams.

(84) **Alcedo atthis pallasii.**—I only saw a single bird and this in the Shalput nullah at Bagtor at 7,900 ft. on May 21.

(85) **Halcyon smyrnensis.**—Before the valley closed in a couple of miles from Muzzaffarabad I saw two or three of these birds, but the deep gorge thence to Ghori seems to have effectively barred their further progress up the valley.

(86) **Upupa epops epops.**—Not common. Only noted at the following places:—
May 5. Keran. One seen on the Nilam plateau.
May 8. Sharda. One by the suspension bridge.

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May 19 and 20. Gurais. One seen near Wampur village and another haunted the P.W.D. Inspection bungalow at Badwan.

These were all light-coloured birds with much white in the crest so presumably *epops*.

(87) **Micropus melba.**—I have already related how I came on a colony of these Swifts at the mouth of the Tithwal gorge, and failed to collect any specimens. Narrow crevices in the rock face each seemed to be occupied by a number of birds. Some of these crevices were horizontal, others almost vertical. Noisy bands visited the crevices at intervals of roughly quarter of an hour, but a certain number of birds evidently seldom or never left them, as twittering noises emanated from within at frequent intervals the whole time I was watching, and on occasions single birds flew out. I climbed up a small steep rocky spur as far as I could but failed to get near enough to see anything. A party was also seen at Salkalla and a few birds were with the Martins seen at Bagtor.

(88) **Micropus apus pekinensis.**– Although only definitely recognised at Pateka, Keran, and Kel, this Swift is almost certainly quite common throughout the valley. Swifts imperfectly seen flying at high altitudes at practically every stage were most probably of this species.

(89) **Micropus affinis.**—A party of Swifts flying about below me in a deep gorge five miles beyond Dhanni was attributed to this species.

(90) **Hirundapus caudacutus nudipes.**—A band of these birds was seen on a number of occasions flying over Keran. After an exhibition of their amazing speed the flight of the Eastern Swifts appeared slow and laboured.

(91) **Caprimulgus macrourus albonotatus.**—Presumably this species. On both sides of the Pateka F.R.H. are deep nullahs; one a mass of tumbled rocks and debris, the other harbouring a small stream with open woods of long-leafed pines on its precipitous flanks. Between them is a grassy spur with pines scattered about it. At dusk each night, sometimes from the spur and always from the direction of the nullahs, I heard the rapid tuck-tuck-tuck of Nightjars. The notes were rapidly repeated in series of varying length at the rate of the ticking of a clock. Soon after the calling started, flighting also began. Going out the moment I first heard them in the hopes of collecting specimens I was surprised to note no less than three birds at once high up in the air hawking insects like Swallows. Standing well up the spur not one came over me low enough for a shot, and over the nullahs they must have been some hundreds of feet up though as it grew darker one commenced to swoop down into the pines further above me. These aerobatics appeared to last about half an hour. The calling also ceased as soon as it was dark. On my way up the spur one calling bird flew out of a pine where it had evidently been sitting about ten or fifteen feet up. After failing to get specimens at Pateka I hoped to meet with them further on but no more were either seen or heard.

[Mr. Hugh Whistler, who has very kindly read through the draft of this paper and examined the few skins collected during the trip, has drawn my attention to the descriptions of Nightjars' calls given in his Survey of the Eastern Ghats (*J.B.N.H.S.*, vol. xxxviii, No. 1). To transfer bird-calls to paper is an almost impossible task and I am not quite convinced that the Pateka Nightjar was not *albonotatus*, but must admit that his suggestion that it was more likely *indicus* may be right. At 9-30 p.m. on May 20 I recorded in my diary 'There is now a new sound (from some distance up the stony nullah)—a double note followed by a lower more subdued one—poo-poo-tuck poo-poo-tuck.']

(92) **Strix aluco biddulphi.**—This fine Owl was heard by the river at Badwan (Gurais) and a male was obtained at Bagtor on May 29 when it paid us a visit at dinner time. Osmaston's version of its call (*J.B.N.H.S.*, vol. xxxii, p. 140) does not seem to me quite correct. It struck me as being 'Hoo—interval—'Hoo'—shorter interval—'Hoo-ho-ho-hoo', the final 'hoo' being somewhat drawn out. In fact the notes are not unlike those of the Turtle-Dove. When picked up not quite dead, the bird I shot snapped its bill quite loudly a number of times. Its testes were not much enlarged, being about the size

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of small peas. A bird was also disturbed by our dogs in thick fir forest above the Bagtor rest-house but it may have been the one I shot.

(93) **Ægypius monachus**.— One of these magnificient Vultures was come upon perched on a deodar branch on the edge of the Nilam plateau at Keran on May 1. On our nearer approach he sailed off in the direction of some towering cliffs a mile up the valley.

(94) **Gyps himalayensis.**—Common throughout the valley.

(95) **Pseudogyps bengalensis.**— One was seen cruising over the confluence of the Kishenganga and Jhelum rivers at Domel on April 17 in company with some Himalayan Griffons.

(96) **Neophron percnopterus percnopterus.**—Seen occasionally as far as Doarian (5,000 ft.). I once saw one of these birds at Sekwas in the Lidar valley at an elevation of nearly 12,000 ft.

(97) **Gypaëtus barbatus grandis.**—Noted throughout the length and breadth of the valley. They seemed just as much at home sailing over the steep forest-clad hillsides as alongside towering cliffs in the gorges, although of course bare crags and rock-strewn slopes above the tree-line is the type of country most usually connected with this bird's habitat.

(98) **Falco subbuteo.**—One pair of Hobbies was noted over Keran on April 30. At Bagtor on May 29 I was hailed from my breakfast to deal with an obviously breeding Sparrow Hawk which had been carrying off Turtle-Doves from nearby. A Hobby had been taken for her by my servants and was sitting at the very summit of an exceedingly tall spruce fir. I managed to bring it down whereupon a second one, which I had not noticed, flew from the next tree emitting wild screams of anger. While skinning the bird procured, which was a female holding nine or ten yolks as much as one-eighth inch in diameter, a second bird, which I thought must be the male returned in search of her, flew into a pine not thirty yards off. As it sailed back towards the wood low over my head it paid the penalty for its temerity. To my surprise it was likewise a female with yolks developing, one being $\frac{3}{16}$ inch across.

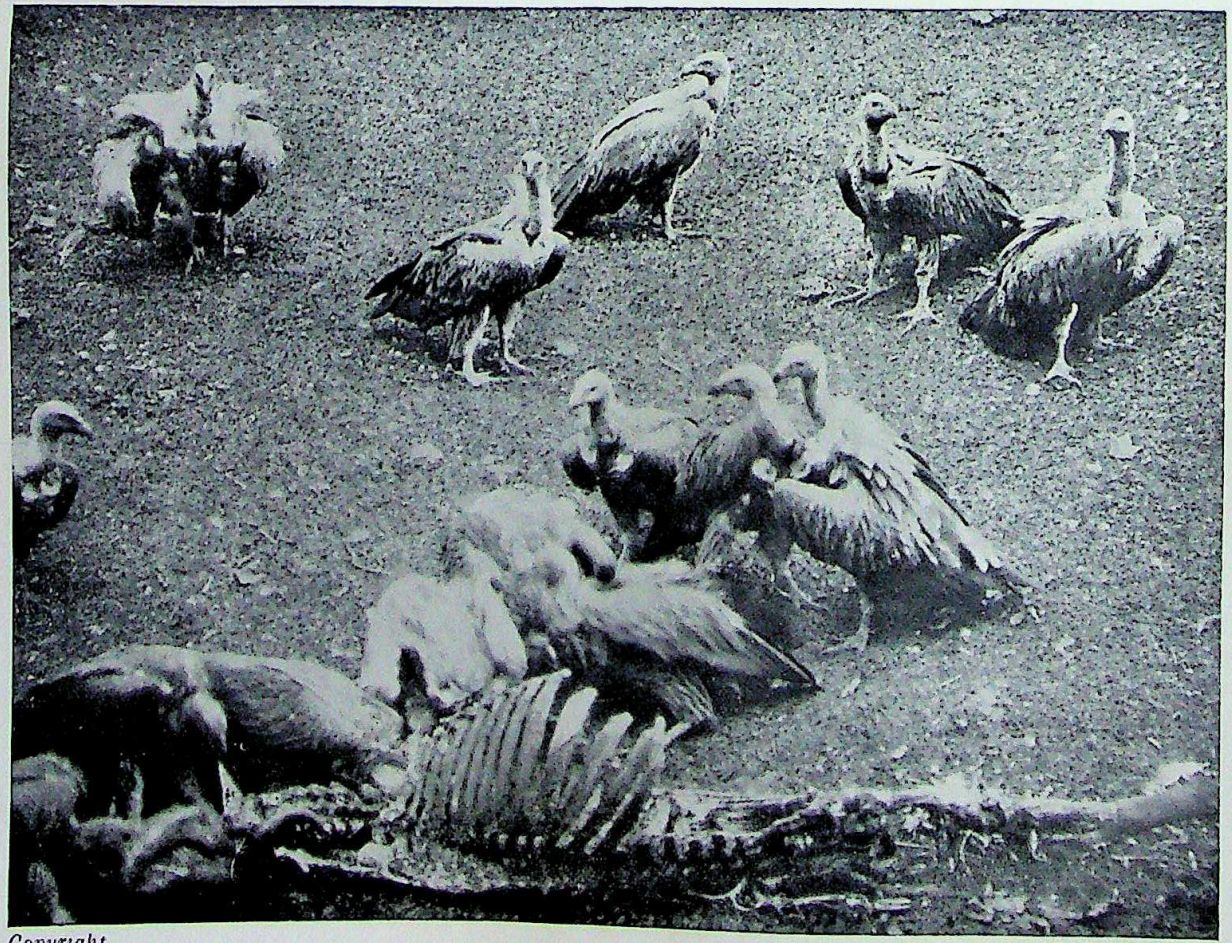
(99) **Cerchneis tinnunculus.**—Kestrels, obviously breeding birds, were seen frequently whenever we passed suitable cliffs. At one point where the path took an abrupt bend over a rocky nullah and then on a wooden gallery up the face of a low cliff, I was able to look on to a sitting bird. Unfortunately some rock plants just prevented me from seeing whether there were eggs in the slight hollow in which the bird was seated. After watching for a couple of minutes its mate arrived whereupon both birds flew to a projecting rock where copulation immediately took place. This was on April 22 five miles from Dhanni at 2,900 ft.

(100) **Milvus migrans govinda.**—This Kite was seen as far as Dhanni.

(101) **Milvus lineatus.**— I came to the conclusion that all the Kites seen from Dhanni to Gurais were of this species. I saw no nests but they must breed in the Valley. I have a record of a nest containing young ones in June at 7,200 ft. in the Lidar valley.

(102) **Accipiter nisus.**—One was shot at Keran on May 5.. Unfortunately its abdomen seemed to have received the full charge, and I found it impossible to tell whether it was a breeding bird or even to sex it. Another was seen on a number of occasions at Sharda between May 8 and 10. As it always returned up the forest whence it had come I did not shoot it hoping to trace a nest. In this I was unsuccessful. Again I came upon one at Bagtor which I saw fairly frequently, as its pet beat was the edge of the forest close to which the rest-house stands. On May 26 it killed a Turtle-Dove within a few yards of us, making a deep gash in its back. When we retreated it plucked the carcase most neatly and carried it off into the thick fir forest. Mounds of Dove feathers in two other places close by proclaimed the fact that other Turtle-Doves had met a similar fate very recently. Unfortunately

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Gyps himalayensis disposing of the body of a young buffalo.

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I had not got the gun with me, added to which she obviously had young ones to feed.

(103) **Columba livia neglecta.**—These Pigeons were not as common as I expected them to be. Flocks were certainly noted occupying suitable ledges and caves in the rocky banks in all the more gorge-like stretches of the river e.g. in the Tithwal gorge, but I never saw them out in the fields where such occurred except at and nearing Taobat where we disturbed two parties of three.

(104) **Streptopelia orientalis ferrago.**— The first one was seen five miles short of Salkalla on April 25 when we entered some rather thick secondary jungle consisting mostly of Ilex. Thereafter they gradually became commoner until at Taobat and Bagtor they were excessively so, roosting just within the fir forests and coming out particularly in the evenings to feed on the margs and in the cultivation.

(105) **Ceriornis macrolophus biddulphi.**—The crow of this Pheasant was heard a number of times during our short stay at Sharda, May 8 to 10, and again from the thick fir forest at river level three miles beyond that place on the march to Kel.

(106) **Alectoris graeca chukar.**—Common on the steep slopes running up to the Nilam plateau at Keran.

(107) **Tringa ochrophus.**—One bird of this species was feeding in a flooded ricefield with a number of Pied Wagtails two miles beyond Pateka on April 22.

(108) **Tringa hypoleucos.**—These birds must move up to their breeding grounds very early. Single birds were seen near Salkalla on April 28 and five miles beyond Dudhnial on May 8, but on reaching the wider more placid stretches of the river halfway between Janwai and Taobat they at once became common. On May 18 shortly after leaving Taobat I came on a pair preparing a nest in some dock-leaves only four yards from the path but twenty from the river bank.

(109) **Phalacrocorax carbo sinensis.**— Noted as follows:—

April 17. A pair circling over the junction of the Kishenganga and Jhelum rivers at Domel.
April 23. A single bird flying downstream halfway up the Tithwal gorge.
April 24. A single bird flew downstream into the Tithwal gorge.
April 25. Before leaving Tithwal a bird was again seen flying into the gorge while a little later one flew upstream, possibly the same bird.
April 27. At Salkalla a Cormorant flew downstream.
May 1. At Keran (5,000 ft.) the last one was seen.

(110) **Ardea cinerea.**—On April 28 a single bird was observed perched on the summit of an isolated tall pine tree near the village of Danudra (4,670 ft.) between Salkalla and Keran. For a couple of miles just here the river is wider and less turbulent with a tree-covered large island almost opposite Danudra. I could see no signs of a Heronry.

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THE MEDICINAL AND POISONOUS GRASSES OF INDIA.

BY

J. F. CAIUS, S.J., F.L.S.

The GRAMINEAE are one of the largest families of plants, including about 480 genera and 5,880 species. They are found in all climates and situations, but are most numerous in temperate regions.

The medicinal and poisonous grasses of the world belong to 78 genera:—AGROPYRON (temperate regions of Europe and Asia); AMPHILOPHIS (tropical Asia and Africa); ANATHERUM (Brazil); ANDROPOGON (tropics of both hemispheres; South Europe, North America, temperate Asia); ANTHEPHORA (Africa); ANTHOXANTHUM (temperate regions); ARISTIDA (all warm dry countries); ARTHRAXON (tropics and subtropics of the Old World); ARUNDINELLA (tropical Asia and America); ARUNDO (Mediterranean region; East Indies, Malay Archipelago, Central and South America, South Africa, Madagascar, New Zealand); AVENA (Mediterranean region; temperate region of the eastern hemisphere); BAMBUSA (Eastern Asia, Australia); BECKMANNIA (China); BRACHIARIA (both hemispheres, mostly African); BROMUS (temperate regions of northern hemisphere, South America); CENCHRUS (tropical and subtropical regions); CEPHALOSTACHYUM (North India, Malaya, Madagascar); CHLORIS (all parts of the world in tropical and subtropical regions); CHRYSOPOGON (Old World tropics, West Indies); COIX (East Indies, Ethiopia; warm regions); CROSSOTROPIS (Africa); CYMBOPOGON (Old World tropics); CYNODON (Australia, cosmopolitan); CYNOSURUS (Mediterranean region; Europe, Canaries); DACTYLOCTENIUM (Tropics); DENDROCALAMUS (South-eastern Asia); DESMOSTACHYA (India to Syria and North Africa); DIARRHENA (China); DIGITARIA (all warm countries); ECHINOCHLOA (warm regions of both hemispheres); ELEUSINE (all warm countries); ELIONURUS (tropical and subtropical regions of both hemispheres); ELYMUS (northern and southern temperate regions); ERAGROSTIS (all warm and temperate regions); ERIANTHUS (mainly tropical); FESTUCA (temperate regions); GLYCERIA (North America); GYNERIUM (South Brazil, Argentina); HETEROPOGON (tropical Africa and Asia to Mediterranean); HIFROCHLOA (temperate regions); HORDEUM (temperate regions; Europe, North Africa, Asia, North and South America); HYGRORHIZA (India, Ceylon, Tongking); IMPERATA (tropical or warm regions of both hemispheres); LOLIUM (temperate regions; Europe, Asia, North Africa); LOPHATHERUM (Indo-Malaya, China, Japan); MANISURIS (tropical countries; India); MELICA (subtropical and temperate regions; Europe, Asia, Africa, America); MELINIS (Africa); MISCANTHIDIUM (tropical Africa south of the Equator, South Africa); NASTUS (Madagascar); OLYRA (Africa); ORYZA (tropical and subtropical regions of both hemispheres); ORYZOPSIS (northern hemisphere); OXYTENANTHERA (Africa, India, Malaya); PANICUM

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(tropical and subtropical regions); PASPALUM (all warm regions); PENNISETUM (most warm dry regions; Africa); PHALARIS (Mediterranean region; South Africa, California to Chile); PHRAGMITES (almost the whole world); PHYLLOSTACHYS (Eastern Asia); POA (temperate regions); POGONARTHRIA (Africa); POLYTOCA (tropical Asia, Australia); SACCHARUM (tropical and subtropical regions of both hemispheres); SASA (China); SECALE (temperate regions); SETARIA (warm and temperate regions); SORGHUM (warm and temperate regions; Africa, India); SPOROBOLUS (tropical and subtropical regions of both hemispheres; America); STENOTAPHRUM (tropics of both worlds); STIPA (tropical and subtropical regions of both hemispheres); THELEPOGON (India to tropical Africa); THEMEDA (tropical and subtropical regions of the world); THYSANOLAENA (Indo-Malayan region); TRITICUM (Mediterranean region; temperate regions); VETIVERIA (tropics of the Old World); ZEA (all warm countries); ZIZANIA (North America, North-Eastern Asia).

The medicinal and poisonous grasses of India belong to 49 genera:—AGROPYRON, AMPHILOPHIS, ANTHOXANTHUM, ARISTIDA, ARTHRAXON, ARUNDINELLA, ARUNDO, AVENA, BAMBUSA, BROMUS, CENCHRUS, CEPHALOSTACHYUM, CHLORIS, CHRYSOPOGON, COIX, CYMBOPOGON, CYNODON, DACTYLOCTENIUM, DENDROCALAMUS, DESMOSTACHYA, ECHINOCHLOA, ELEUSINE, HETEROPOGON, HORDEUM, HYGRORHIZA, IMPERATA, LOLIUM, LOPHATHERUM, MANISURIS, ORYZA, OXYTENANTHERA, PANICUM, PASPALUM, PENNISETUM, PHALARIS, PHRAGMITES, PHYLLOSTACHYS, POLYTOCA, SACCHARUM, SETARIA, SORGHUM, STENOTAPHRUM, STIPA, THELEPOGON, THEMEDA, THYSANOLAENA, TRITICUM, VETIVERIA, ZEA.

I. Spikelets spicate, all unisexual, male spikes in terminal panicles or continuous with the female spikes.
  a. Fruiting spikelets enclosed in a strong nut-like polished bract ... ... COIX.
  b. Fruiting spikelets having all the inner glumes concealed within the greatly enlarged hardened outer POLYTOCA.
  c. Fruiting spikelets densely crowded on a cylindric spongy rachis ... ... ZEA.

II. Spikelets homo- or heterogamous, 1-2-flowered, solitary or 2- rarely 3-nate, on the internodes of an articulate spike or raceme.
  Spikelets 2-nate; lower involucral glume globose ... MANISURIS.

III. Spikelets with a terminal perfect flower, and one or more imperfect male or neuter below it; rachilla not produced beyond the perfect flower.
  a. Panicle contracted or spiciform; spikelets awnless PHALARIS.
  b. Panicle spiciform; glumes 6, III and IV neuter, awned, stamens 2 ... ... ANTHOXANTHUM.

IV. Spikelets panicled; rachilla not produced beyond glume III; floral glumes rigid or hard, awned.
  a. Glume III narrow, awn 3-flowered ... ... ARISTIDA.
  b. Glume III narrow, awn entire, grain terete ... STIPA.

V. Spikelets homogamous, in compound racemes or panicles. Lower involucral glume not sunk in a hollow of the rachis.
  a. Rachis not fragile. Spikelets in a cylindric silvery thyrsus ... ... IMPERATA.
  b. Rachis fragile. Spikelets in a thyrsus of spiciform racemes ... ... SACCHARUM.

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VI. Spikelets many, in solitary digitate or fascicled spikes, usually heteromorphous. Lower involucral glume not sunk in a hollow of the rachis. Margins of the lower involucral glume of sessile spikelet not inflexed.

a. Spikes 2-nate or digitate; spikelets 1-flowered ... ARTHRAXON.
b. Spikes digitate; spikelets 2-flowered; glume I tubercled ... ... THELEPOGON.

VII. Spikelets heterogamous, 1-flowered, 2-rarely 3-nate on the whorled articulate branches of simple or compound racemes or panicles.

a. Spikelets in two superposed series; upper series of heterogamous pairs, and a terminal male, lower a whorl of 4 persistent males or neuters ... THEMEDA.
b. Spikelets 2-nate, or the uppermost 3-nate, spicate or panicled.

i. Sessile spikelets of all the pairs alike in sex and form throughout the spikes.
¶ Joints of rachis many, stout or slender, opaque VETIVERIA.
¶¶ Joints of rachis few; spikes articulate on the obliquely truncate bearded tips of the branches of the panicle ... ... CHRYSOPOGON.
¶¶¶ Joints of rachis very few, filiform, opaque; lodicules ciliate; grain dorsally compressed SORGHUM.
¶¶¶¶ Joints of rachis and pedicles of upper spikelets linear compressed with usually a central translucent channel and thickened margins ... AMPHILOPHIS.

ii. Lowest one or more sessile spikelets differing from all those above it in sex or form.
¶ Spikes binate on the peduncle which is enclosed in a spathiform sheath; sessile spikelet dorsally compressed ... ... CYMBOPOGON.
¶¶ Spikes solitary, lower pairs of spikelets very unlike the upper; upper sessile spikelets cylindric ... ... HETEROPOGON.

VIII. Spikelets 2-flowered; upper flower bisexual, lower male or neuter, rarely both fertile.

a. Spikelets dorsally flattened, base not thickened; glumes 3 with very rarely a minute 4th ... PASPALUM.
b. Spikelets panicled or spicate; lower floral glume not beaked, upper floral glume crustaceous ... PANICUM.
c. Spikelets innumerable, very minute, hairy, densely crowded in the capillary branches of a very large panicle ... ... THYSANOLAENA.
d. Spikelets persistent on the pedicels, or glumes I and II separately deciduous, IV deciduous; usually awned, awn bent ... ... ARUNDINELLA.
e. Glumes awned from the entire acute or acuminate tip or caudate or cuspidate-acuminate. Racemes dense, more or less secund ... ... ECHINOCHLOA.
f. Spikelets articulate on their pedicels, each surrounded by an involucel of bristles ... ... SETARIA.
g. Spikelets persistent on their pedicels, at least the fertile, or deciduous with their pedicels.

i. Spikelets in involucelled deciduous fascicles.
¶ Involucel of bristles ... ... PENNISETUM.
¶¶ Involucel of spines connate at the base ... CENCHRUS.

ii. Spikelets not involucelled, 2-seriate on a flat subarticulate rachis ... ... STENOTAPHRUM.

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IX. Spikelets 2- or more-flowered; rachilla produced.
Spikelets 2-6-flowered; flowering glumes awned; awn subterminal or dorsal ... AVENA.

X. Spikelets panicled, 2-many-flowered; glumes very narrow, flowering glumes penicillate.
a. Rachilla elongate, glabrous; flowering glumes silkily hairy ... ... ARUNDO.
b. Rachilla very short; flowering glumes glabrous; callus with long silky hairs ... ... PHRAGMITES.

XI. Spikelets 1-many-flowered, 1-2-seriate on the rachis of a simple spike or on the long slender branches of a simple panicle. Leaves broad, tessellately nerved.
Spikelets 1-flowered, secund and articulate at the base; upper glumes empty, convolute with setiform tips ... ... LOPHATHERUM.

XII. Spikelets usually panicled, 2- or more-flowered; floral glumes 5-many-nerved, upper empty or 0; styles short.
Spikelets panicled, 3-many-flowered; floral glumes mucronate or awned, dorsally rounded, 5-9-nerved, top of ovary lobed villous ... ... BROMUS.

XIII. Inflorescence various; spikelets 2-many-flowered; flowering glumes 1-3-nerved, entire, 3-toothed, 3-lobed, or 3-awned. Floral glumes entire; acute or acuminate ... ... DESMOSTACHYA.

XIV. Spikelets 1- or more-flowered, biseriate and secund on an inarticulate spike or on the spiciform branches of a slender panicle; flowers all or the lower only bisexual.
a. Spikes digitate, 1-flowered, upper imperfect flower absent ... ... CYNODON.
b. Spikes solitary, spicate or racemed; spikelets 2- or more-flowered, upper flower imperfect ... CHLORIS.
c. Spikes digitate or whorled; spikelets 3-6-flowered, densely crowded, awnless ... ... ELEUSINE.
d. Spikes terminating with a sharp point; upper involucral glume and floral glumes rigidly mucronate or shortly awned ... ... DACTYLOCTENIUM.

XV. Spikelets 1-flowered, articulate on their pedicels and deciduous from them; palea 1-3-nerved, stamens 6 or fewer.
a. Spikelets bisexual, awned; glumes 2, narrow, thin HYGRORHIZA.
b. Spikelets bisexual, awned or not; glumes 4; I and II minute or setaceous ... ... ORYZA.

XVI. Spikelets sessile, singly or in clusters; florets 1 or more.
a. Flowering glumes 5-9-nerved, lateral nerves not conniving; short or ending in teeth or awns ... TRITICUM.
b. Flowering glumes 5-7-nerved, lateral nerves conniving or confluent with the single terminal awn AGROPYRON.
c. Spikelets solitary at the nodes of the spike, 3-many-flowered; glumes coriaceous, lower involucral absent, except in the terminal spikelet; floral glumes 5-many-nerved ... ... LOLIUM.
d. Spikelets in groups of 3 at the nodes of a dense spike; floral glumes 5-nerved ... ... HORDEUM.

XVII. Shrubby or arboraceous grasses. Leaves flat jointed on the sheath.
a. Pericarp thin, adnate to the seed.
i. Stamens 3; spikelets 1-4-flowered, spicate; empty glumes 2-3 ... ... PHYLLOSTACHYS.

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ii. Stamens 6; filaments free; paleas entire or slightly cleft, all 2-keeled ... .. BAMBUSA.

iii. Stamens 6; filaments connate. Spikelets few-flowered, palea of upper flower absent or glume-like, not keeled ... ... OXYTENANTHERA.

b. Pericarp crustaceous; seed free; spikelets 2-many-flowered; palea 2-keeled, lodicules none; ovary hirsute at the top ... ... DENDROCALAMUS.

c. Fruit oblong, beaked, pericarp thick, separable. Spikelets 1-flowered, bracteate, crowded in globose heads ... ... CEPHALOSTACHYUM

AGROPYRON.

This genus numbers 45 species, inhabiting mainly the temperate region of Europe and Asia.

Agropyron repens Beauv. (=*Triticum repens* Linn.) is found in Kashmir and Western Tibet, ascending up to 14,000 ft. in the Karakoram Range. This grass is a native of Europe, where it is found freely in road-sides, fields and waste places. The commercial supplies come largely from England and Germany. The plant now abounds in meadows and cultivated grounds in the northern United States of America, where it is often very troublesome as a weed. 'This grows in gardens and arable lands, as an infirmitie or plague of the fields, nothing pleasing to husbandmen; for after the field is plowed, they are constrained to gather the roots together with harrowes and rakes, and being so gathered and laid upon heaps, they set them on fire lest they should grow againe.'

'Although that Couch-grasse be an unwelcome guest to fields and gardens, yet his physicke vertues do recompense those hurts. Couch-grasse healeth green wounds.'

The plant has been employed in England from remote times as a vulnerary, and to remove difficulties of urination. 'Being boiled and drunk it openeth obstructions of the liver and gall, and the stoppings of urine, and easeth the griping pains of the belly, and inflammations; wasteth the matter of the stone in the bladder, and the ulcers thereof also. The seed doth more powerfully expel urine and stayeth laxes and vomiting. The distilled water alone, or with a little worm-seed, killeth the worms in children.

'The way of use is to bruise the roots, and having well boiled them in white wine, drink the decoction; it is opening, but not purging, very safe; 'tis a remedy against all diseases coming of stopping, and such are half those that are incident to the body of man; and although a gardener be of another opinion, yet a physician holds an acre of them to be worth five acres of carrots twice told over.'

In modern days an infusion of the root is generally regarded as a soothing diuretic, helpful to the bladder and kidneys. Formerly, this was a popular drink to purify the blood in spring. The decoction may be made from the whole fresh plant, or from the dried root sliced, two to four ounces being put in a quart of water, reduced to a pint by boiling. A wineglassful of this may

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be given for a dose. It certainly palliates irritation of the urinary passages, and helps to relieve against gravel. A liquid extract is also dispensed by the druggists, of which one or two teaspoonfuls are given in water.

In Europe the decoction is used to a considerable extent as a diluent and slightly nutritious drink. The French specially value it for its stimulating fragrance of vanilla and rose perfumes.

The rhizome is officinal in the pharmacopeias of France, Switzerland and Turkey. It is diuretic, demulcent and aperient. It exerts an influence upon the genito-urinary organs, and it is used internally as a demulcent drink for irritable bladder, and also for cystitis. It is one of the least stimulant of the remedies of its class, and may be employed very freely. It is also recommended in gout and rheumatism.

The rhizome contains grape sugar, fruit sugar, a sugar of undetermined identity, gum and inosite. It is also said to contain glucosides, one of which yields vanillin on hydrolysis, also a carbohydrate resembling inulin which has been named *triticin*.

Brahui: Milinj—; *Catalan*: Agram, Gram—; *Chinese*: Se Mao Ts'ao—; *Dutch*: Kweek—; *English*: Couch Grass, Dog Grass, Quack-grass, Quick Grass, Quilch, Twitch Grass, Witch Grass—; *French*: Agram, Agropyre rampant, Auge, Blé sauvage, Chiendent, Chiendent des boutiques, Chiendent officinal, Chiendent ordinaire, Froment rampant, Herbe à deux bouts, Laitue de chien, Petit chiendent, Sainte neige, Tranuge, Vagon, Wagon—; *German*: Ackergras, Ackermannswurzel, Bagenwurzel, Fadenwurzel, Fegwurzel, Flechtgras, Graswurzel, Haarstrang, Hundsgraswurzel, Hundsruecken, Knotengras, Kriechweizen, Landdreck, Paeden, Peden, Peyer, Poeden, Queck, Rebel, Ribel, Schnur, Schweinegras, Sehnengras, Spulwurz, Tuerkisches Gras, Weisswurz, Wreeten, Wuemgras, Wurmgras, Zweckenwurzel—; *Greek*: Agrostis—; *Italian*: Caprinella, Dente canino, Graminga, Granacina—; *Polish*: Perz—; *Portuguese*: Grama—; *Provence*: Grame—; *Roumanian*: Albeiu, Iarba caineasca, Pir—; *Russian*: Eja, Pirei, Porei—; *South Africa*: Couch Grass, Dog Grass, Triticum—; *Spanish*: Grama, Grama de las boticas—; *Swedish*: Quick hwete—; *Tasmania*: Couch—; *Turkish*: Ayrikotu—.

Amphilophis.

This genus consists of 25 species or more, distributed throughout tropical Africa and Asia, many of them closely allied and difficult to differentiate.

Amphilophis odorata A. Camus (=*Andropogon odoratus* Dna. Lisboa) is found in the Deccan, where it is considered carminative.

Bombay: Ushadhana—.

Anthoxanthum.

The genus includes 4 or 5 species, natives of Europe and temperate Asia; one being found also in North America and Australia.

Anthoxanthum odoratum Linn. is a native of Europe and Central and Northern Asia occasionally found in the hill districts of India, but only as introduced by man or as an escape from cultivation. It is found in North Africa and the Atlantic Islands. Naturalised in North America it occurs as a meadow grass in pastures from Washington to California.

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This grass is specially provocative of hay fever and hay asthma with persons liable to suffer from these distressing ailments. Accordingly a medicinal tincture is made from it with spirit of wine, and if some of the same is poured into the open hand-palms for the volatile aroma to be sniffed well into the nose and throat, immediate relief is afforded during an attack. At the same time three or four drops of the tincture should be taken as a dose with water, and repeated at intervals of twenty or thirty minutes, as needed.

The flowers contain *coumarin*, and their volatile pollen impregnates the atmosphere in early summer. But, strange to say, while the plants growing in spring have a delightfully characteristic odour and a pleasant aroma, those flowers which appear late in autumn emit a most nauseating odour.

English: Pig Grass, Sweet-scented Grass, Sweet-scented Spring Grass, Sweet-scented Vernal Grass, Sweet Vernal Grass—; *French*: Flouve odorante—; *German*: Ruchgras—; *Italian*: Paleino odoroso, Paleo—; *Uruguay*: Grama de olor—.

Aristida.

It is assumed that this genus includes about 300 species, natives of warm countries.

Aristida adscenscionis Linn. is found throughout the plains and low hills of India, Burma and Ceylon, ascending to 8,000 ft. in Kashmir; it is distributed over most warm countries.

In Madagascar an ointment consisting of lard and the ashes of the flowers is used topically for itch and ringworm.

Hova: Horombavy, Pepaka—; *Southern Nigeria*: Oka olongo—.

Arthraxon.

The genus consists of 20 species distributed throughout the tropics and subtropics of the Old World.

Arthraxon ciliaris Beauv. is found in the hilly districts of India from Kashmir eastwards to Burma, ascending the Himalaya to 5,500 ft., and southwards to the Nilgiri Hills and Ceylon. It extends to southern and central China, and Shantung.

The plant is used medicinally in various parts of China.

Bombay: Turade, Turde—; *Chinese*: Chin Ts'ao—.

Arundinella.

This genus consists of about 55 species, found mainly in Tropical Asia and America.

Arundinella brasiliensis Raddi occurs throughout the hilly parts of India, from the Himalaya, ascending to 7,000 ft., to Burma and Ceylon. It is distributed to China, Malaya, Australia, South Africa, South Europe, tropical America.

The natives of Basutoland use the plant in compounding many medicines and in making a lotion for washing wounds.

Bombay: Dundi, Kotir—; *Suto*: Mahlakamane—.

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Arundo.

This genus includes 12 species, natives of the Mediterranean region, and distributed to the East Indies and the Malay Archipelago, Madagascar, New Zealand, Central and South America.

Arundo donax Linn. is found in the Lower Himalaya from Kashmir to Nepal, ascending to 3,500 ft., from the Punjab to Sylhet, the Naga Hills up to 5,000-8,000 ft., Burma, the Circars, Coorg, the Nilgiri Hills. It extends westwards to Europe, North Africa and North Asia.

The rhizomes are much used in decoction as an emollient and diuretic. They are said to stimulate the menstrual discharge and diminish the secretion of milk.

Catalan: Canya—; *Egypt*: Busfarisk, Bus haggai, Buz haggni, Ghab, Gub-rumy, Gasab—; *English*: Common Reed, Giant Reed, Great Reed, Reed, Spanish Cane—; *French*: Canne de Provence, Donax, Grand roseau—; *Greek*: Kupho Kalamo—; *Indo-China*: Cong, Cuoi, Dich lo chuc—; *Italian*: Canna—; *Maltese*: Kasba—; *Portuguese*: Canna—; *Spanish*: Caña comun—; *Sokoto*: Gabara, Machara, Wutsiyar giwa—; *Yemen*: Kassab—.

Avena.

This genus numbers about 55 species found chiefly in temperate regions.

A. fatua Linn., *A. sativa* Linn., *A. sativa* var. *orientalis* Hook. f. are used medicinally in Europe; *A. fatua* Linn. is also used in China.

1. Ligule short, very obtuse, up to 3 mm. long ... *A. fatua.*
2. Ligule truncate, 1-3 mm. long ... ... *A. sativa.*

1. **Avena fatua** Linn. is found in the Punjab, North-Western Himalaya, and Western Tibet, in cultivated fields, ascending to 9,000 ft.; also in Sikkim Himalaya up to 9,000 ft. It is distributed to temperate Europe, Northern Africa and Northern Asia.

In Europe the seeds are used for their emollient, refrigerant, and diuretic properties.

In the Punjab the seed is believed to produce poisonous and deleterious effects.

Arabic: Bakhragan, Basheruk, Ghallash sheytany, Khafur, Shair-el-ghul, Sabus ssabbaras, Zommeyr—; *Catalan*: Cugula—; *Chinese*: Ch'iao Mai—; *Egypt*: Chafur, Sammeir—; *English*: Drake, Wild Oat—; *French*: Avéneron, Averon, Avoine bouffe, Avron, Coquiolle, Couyonne, Folle avoine, Pied de mouche—; *German*: Windhafer—; *Greek*: Agrio genima—; *Hindi*: Gandal, Ganer, Jei, Kuljud—; *Iraq*: Dosar, Shofan, Sunaislah—; *Italian*: Lippa—; *Jhalawan*: Gandamkao—; *Kurdish*: Gia brishi, Kaltas—; *Languedoc*: Coughioulo—; *Mosul*: Hurtuman—; *Punjab*: Ganerjei, Gozang, Kasamm, Upwa, Yupo—; *Roumanian*: Odos—; *Russian*: Jivoi ovios—; *Spanish*: Avena loca, Cula—; *Turkish*: Chodar—.

2. **Avena sativa** Linn. is cultivated in Northern India, from Bengal to the Indus; and in the Himalaya up to 12,000 ft. It was known to the ancients, and is now cultivated in all civilized countries; but its original locality has not been satisfactorily ascertained. It grows wild in Sicily, and is said to have been seen in the Island of Juan Fernandez, off the Coast of Chili.

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'Common Otes put into a linnen bag, with a little bay salt quilted handsomely for the same purpose, and made hot in a frying pan, and applied very hot, easeth the pain in the side called the stitch.' Oats fried with bay salt, and applied to the sides, take away the pains of stitches and wind in the sides of the belly.

'A poultice made of the meal of oats, and some oil of bays added, helps the itch and leprosy; as also the fistulas of the fundament, and dissolves hard imposthumes.' A yeast poultice made by stirring oatmeal into the grounds of strong beer is a capital cleansing and healing application to languid sloughing sores.

The meal of oats boiled with vinegar and applied, takes away freckles and spots in the face, and other parts of the body. 'Ote-meale is good for to make a faire and wel-coloured maid to look like a cake of tallow, especially if she take next her stomacke a good draught of strong vinegre after it.'

As a food oatmeal is apt to undergo some fermentation in the stomach, and to provoke sour eructations. Furthermore, it is somewhat laxative, because containing a certain proportion of bran which mechanically stimulates the intestinal membranes; and this insoluble bran is rather apt to accumulate.

American doctors have taken of late to extol the Oat when made into a strong medicinal tincture with spirit of wine, as a remarkable nervine stimulant and restorative: this being especially valuable in all cases where there is a deficiency of nervous power, for instance, among over-worked lawyers, public speakers, and writers.

The tincture is ordered to be given in a dose from ten to twenty drops, once or twice during the day, in hot water, to act speedily; and a somewhat increased dose in cold water at bed-time so as to produce its beneficial effects more slowly then. It proves an admirable remedy in nervous prostration and exhaustion after all febrile diseases, and in sleeplessness from nervous exhaustion. It seems to exert a very beneficial action upon the heart muscles and on the urinary organs, speedily relieving spasmodic conditions of bladder and ureter.

Catalan: Sibada—; *Dutch*: Haver—; *English*: Groats, Haws, Oat, Oats—; *French*: Avoine, Avoine cultivée, Avoine noire—; *German*: Haber, Hafer—; *Greek*: Bromi—; *Hindustani*: Jai—; *Hova*: Varintsoavahy—; *Hungarian*: Zab—; *Italian*: Avena, Vena—; *Languedoc*: Arracho, Aveino, Civada, Civado, Sibado—; *Malta*: Oats, Avena, Hafur—; *Polish*: Owies—; *Portuguese*: Avea—; *Punjabi*: Javi—; *Roumanian*: Oves—; *Russian*: Ovios—; *Spanish*: Avena—.

Avena sativa var. **orientalis** Hook. fil. is characterised by the presence of bristly hairs at the base of glume III. It is found in North-Western India, the Soane Valley, and Murshidabad.

The seeds are used in Spain as an emollient, refrigerant, and diuretic.

Bambusa.

This genus consists of about 73 species, occurring in Eastern Asia, Malaya, and one in Australia.

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B. arundinacea Retz. is used medicinally in Guiana, *B. barbata* Trin. in Madagascar, *B. vulgaris* Schrad. in Indo-China.

B. blumeana Schult. is used as a poison in Malaya.

I. Arborescent or shrubby. Stems not spinous ... 1. *B. vulgaris.*

II. Arborescent. Stems spinous.

a. Stem-sheaths long blade with felted hairs within. Empty glumes 0-2 ovate lanceolate acute or mucronate, many-nerved ... 2. *B. arundinacea.*

b. Stem-sheaths short. Empty glumes 2-3 ovate acute, 3-7 nerved ... ... 3. *B. blumeana.*

1. **Bambusa vulgaris** Schrad. is cultivated throughout tropical India and in all hot countries.

The roots, the shoots, the bark and the leaves are all used medicinally in Indo-China.

The roots and the shoots are considered emollient, diuretic, diaphoretic; they are used to purify the blood, and they are commonly administered for obstruction, retention of urine, indefinite pain and syphilis. Mixed with equal parts of tobacco and betel leaves, the fresh root is macerated in oil and applied externally to hard tumours and in cirrhoses.

The astringent bark is used in haemorrhage, excessive menstruation, nausea and vomiting.

The leaves are cooling and emollient; a decoction is given in fevers, melancholia, cough and sore throat.

In Cambodia the nodes are considered bechic, astringent, tonic and depurant; they are prescribed in bronchitis, blennorrhagia, leucorrhoea, metrorrhagia and the yaws.

Bengal: Basini bans—; *Bombay*: Kallak, Vansa kalaka—; *Cambodia*: Asey, Russey—; *English*: Yellow and Green Striped Bamboo—; *French*: Bambou des jardins—; *Indo-China*: Long dau chuc, Tam vong, Tre tau, Tre vuon—; *Malay*: Buluh minyak has, Buluh pan—; *Sinhalese*: Una—.

2. **Bambusa arundinacea** Retz. is found throughout the plains and low hills of India, Burma and Ceylon, wild and cultivated. It is cultivated in the lower Himalaya and in the valleys of the Ganges and Indus.

The hollow stems of this bamboo often contain a silicious and crystalline substance known in the bazaars of India as *tabashir*. This is largely used by Hindus and Mahomedans who prize it very highly as a stimulant and aphrodisiac. It is a demulcent, tonic, aphrodisiac and pectoral, which has been found useful in cough, consumption, asthma and fever. In combination with other astringent medicines it is given in chronic dysentery and internal haemorrhages.

The most efficacious application for dislodgement of worms in ulcers is a poultice made by pounding the young shoots of the bamboo. The juice is first poured on the vermin, and the ligneous mass is applied and secured by a bandage.

Yunani practitioners consider the root a good tonic; they apply the ash to ringworm, bleeding gums and pains in the joints. In the Tamil country the root is considered diluent, the bark is used as a cure for eruptions, the leaves are given to stimulate the

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menstrual flow, and the tabashir is prescribed in paralysis and for flatulence.

A belief in the emmenagogue properties of the leaves is common alike in India and in China. A decoction of the leaf-bud is said to be very effective. The juice of the leaves with aromatics is given in blood vomiting. With black pepper and common salt the leaves are used to check diarrhoea in cattle.

The juice of the flower is dropped in the ear for earache, and in deafness.

A decoction of the joints is supposed to have an action on the uterus, and is used by females after delivery to cause a free flow of the lochial discharge. The same part of the plant pounded with water is applied to inflamed joints.

The Ayurvedists describe the seeds as acrid, sweet, aphrodisiac and fattening. They use them freely in biliousness, urinary discharges and all forms of poisoning.

Mhaskar and Caius have shown experimentally that the bark, the seeds and the tabashir are equally useless in the antidotal treatment of either snake bite or scorpion sting.

Annam: Tre, Tre pheo—; *Arabic*: Qasab—; *Assam*: Bnah, Kata, Koto—; *Bengal*: Bans, Bansh, Behurbans, Kautabans, Ketua—; *Bombay*: Dougi, Kalak, Mandgay, Padhai—; *Burma*: Kyakatwa—; *Canarese*: Bambu, Bidaru, Bidiru, Bidirumale, Bidru, Bidungalu, Bidungulu, Biduru, Dongi, Elubidiru, Gale, Hebbidiru, Hebbidru, Hennubidiru, Kalale, Karira—; *Cantonese*: T'in Chuk Wan, T'in Chuk Wong—; *Catalan*: Bambu—; *Central Provinces*: Kattang—; *Chinese*: T'ien Chu Huang, T'ien Chu Yuen—; *Chittagong*: Bariala—; *Deccan*: Bambu, Bhans, Chansa—; *English*: Spiny Bamboo, Thorny Bamboo—; *French*: Bambou, Bambou commun, Canne bambou—; *French Guiana*: Bambou—; *Garo*: Whahkanteh—; *German*: Bambus—; *Gond*: Katiwadur—; *Gujerati*: Toncor, Wans—; *Haldwani*: Kanwas—; *Hasada*: Katangarimad—; *Hindi*: Bans, Kantabans, Kattang, Magarbans, Malbans—; *Italian*: Bambu, Canna indiana—; *Java*: Singkara—; *Kadir*: Mula, Mulai—; *Kolami*: Katammadh, Katanga—; *Konkan*: Kalak, Padhai—; *Konkani*: Conoqui, Kanaki, Vellu—; *Korku*: Mad—; *Kumaon*: Kanta bans—; *Lambadi*: Bambu—; *Lao*: Mai pai—; *Madras*: Pontevedurn—; *Magahi*: Wanah—; *Malaya*: Thian chook wong—; *Malayalam*: Illi, Kampu, Kaniyaram, Karminaram, Mula, Mulmulam, Pattil, Tejanam, Trinadhvajan, Valiyamula, Venu—; *Marathi*: Kallak—; *Mundari*: Katanggamad, Katanggarindd—; *Naguri*: Katangmad—; *Panch Mahals*: Vas—; *Persian*: Nai—; *Portuguese*: Bambu espinhoso, Spodio—; *Provence*: Boulou—; *Punjab*: Magae, Nal—; *Roumanian*: Bambu—; *Russian*: Bambuk—; *Sanskrit*: Bahupallava, Brihattrina, Dhanurdruma, Dhatushya, Dridhagranthi, Dridhakanda, Dridhapatra, Durarnha, Kamatha, Kantaki, Kantalu, Karmmara, Kichaka, Kilati, Kishkuparva, Kugshirandhra, Mahabala, Maskara, Mrityubija, Navagragandha, Phalantaka, Purvayoni, Pushpaghataka, Shataparva, Shatpadalaya, Suparva, Suparvan, Tajana, Tejana, Trinadhvaja, Trinaketu, Trinaketuka, Tvachisara, Tvakasara, Vadaniya, Vansha, Vanya, Venu, Yavaphala—; *Santali*: Mat—; *Sinhalese*: Kattuuna, Una—; *Spanish*: Bambu, Caña de Indias para bastones, Mambú—; *Tagalog*: Canayangtotoo—; *Tamil*: Ambal, Ambu, Aril, Bongu, Iraivarai, Kalai, Kambu kilai, Kisagam, Kulaimungil, Masukkaram, Mirittusam, Mudangal, Mulai, Mullumungil, Mundlaveduru, Mundul, Mungil, Nadimungil, Nedil, Nettil, Palandam, Panai, Pandil, Pasy, Periamungil, Perumungil, Peruvarai, Sabam, Sanagi, Sey, Tandu, Tattai, Tulai, Tumbu, Valai, Vannigaruppam, Varaimungil, Vedir, Velam, Venu, Veral, Vey, Veyal, Vindil—; *Telugu*: Bongu, Bongudu, Bonguveduru, Kichakamu, Maskaramu, Mullaveduru, Mudusuveduru, Pentiveduru, Trinadhvajamu, Veduru—; *Thana*: Kalak, Katestokar, Padai—; *Tongking*: Tre gai—; *Tulu*: Bedru—; *Upper Godavery*: Kanka—; *Urdu*: Bansa—; *Uriya*: Beudobaunso, Kontabanso, Kontabaunso—; *Uruguay*: Bambú, Caña.

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3. **Bambusa blumeana** Schult. is indigenous, and also cultivated to some extent, in the open sandy country of the Malay Peninsula, at Pekan in Pahang, at Perlis and Kanga in Kedah. It extends to the Malay Islands.

The very fine hairs found on the sheath leaves of the young sprouts are prominent among Malay poisons. They are used either alone or in combination with other things.

Malay: Buloh duri, Buluh duri—.

Bromus.

This genus numbers about 40 species, found mostly in the temperate regions of the Northern hemisphere and of South America, several in the high mountains of the tropics.

B. catharticus Vahl., a Peruvian plant, is said to be purgative, and *B. purgans* Linn. of Canada is reputed emetic.

Bromus mollis Linn. is found in North-West India, Europe, the Mediterranean region as far as Persia, Western Siberia, Japan and the Atlantic Islands. It is naturalised in North and South America.

The grains of this plant bring on giddiness in man and the quadrupeds, and are fatal to poultry.

English: Bull-grass, Goose-corn—; *Italian*: Spigolina—; *Maltese*: Hortan, Hurtan—.

Cenchrus.

This genus consists of about 25 species, found in the warm regions of both hemispheres, and in temperate North America.

Cenchrus catharticus Del. occurs in the Punjab and in the Upper Gangetic Plain. It is found in Perim Island, at the mouth of the Narbada River, and is distributed over Arabia, and tropical Africa.

In La Reunion a decoction of the fruits is taken as a diuretic and pectoral.

Bombay: Baront, Kukar—; *Hausa*: Karangiya—; *La Reunion*: Gratte-cul, Pagode—; *Rajputana*: Bharut—; *Sudan*: Cram-cram, Heskanit—.

Cephalostachyum.

This genus numbers 8 species inhabiting North India, Malaya and Madagascar.

Cephalostachyum capitatum Munro is found in the Sikkim and Bhutan Himalaya at 2,000-8,000 ft., and also in the Kasia, Jaintea and Naga Hills.

The leaves are much used medicinally in Madagascar. The infusion, 60 leaves for a litre of water, is given as tonic, anthelmintic, stomachic and carminative. An ointment consisting of 20 parts of ash and 30 parts of lard or suet is applied for the itch and for rheumatism.

Betsimisaraka: Volozatsy, Volozevona—; *Lepcha*: Pa-yang, Pa-yong—; *Madagascar*: Volo, Volotsangana—.

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Chloris.

This genus contains 75 species found in the tropical and sub-tropical regions of both hemispheres.

C. petraea Thunb. yields hydrocyanic acid.

Chloris virgata Sw. is found abundantly in Rajputana, Upper and Lower Gangetic Plains, southwards to Bihar, Central and Southern India, Burma, Western Tibet. It extends westwards to Algeria, and is distributed over China, Mongolia, Tropical and South Africa and America.

A decoction of the plant or of its roots is used by the Xosas of South Africa as an addition to baths for the treatment of colds and rheumatism.

Rajputana: Gharaniagas—; *Nigeria*: Kafar gauraka, Kafar fakar, Sawun gauraka—; *Telugu*: Uppugaddi—; *Transvaal*: Sweet Grass, Zoet Grass—; *Xosa*: uMadolwana—.

Chrysopogon.

This genus consists of about 18 species found in the hot parts of the Old World, a few extending into the temperate zones; one in Florida and Cuba.

Chrysopogon serrulatus Trin. occurs in the Western Himalaya, from Kashmir to Nepal, ascending to 6,000 ft. It is found in the hilly districts from the Punjab to Bihar and Orissa, Burma and southwards to Ceylon. It extends to Indo-China, Afghanistan, Portuguese East Africa, Madagascar, Rhodesia and South Africa.

The plant is said to yield hydrocyanic acid. The seeds are a popular vermifuge in Annam.

Annam: Bong co, Co may, Co mu, Nam hoang lien—; *Indo-China*: Chiendent grenille—; *Jhalawan*: Kaj—; *Kharan*: Kohigayab—; *Kila Saifulla*: Sabba—; *Nushki*: Kuj—; *Pab*: Kaj—; *Quetta*: Kohigayab—.

Coix.

The genus includes 5 or 6 species, natives of the East Indies and Ethiopia, one being broadly dispersed in warm regions.

Coix lachryma-jobi Linn. is found throughout the hotter and damper parts of India and Ceylon, wild and cultivated—not wild in Ceylon. It is distributed over tropical Asia, and is cultivated in Africa and America.

Yunani doctors use the seed as a tonic and diuretic. In Western practice the seeds are given as a tincture or decoction in catarrhal affections of the air passages and in inflammation of the urinary passages. In Tongking they are considered a good blood purifier and an excellent diuretic.

The kernels deprived of their shells are used as a food and medicine throughout China, Malaya, Indo-China, the Philippine Islands, and in La Reunion. They make an excellent diet drink for invalids, and have diuretic and cathartic properties. They are also employed for lung and chest complaints.

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Among the Santals the root is given in strangury and in the menstrual complaint known as 'silka'.

An infusion of the parched and ground grains is used instead of tea by the Japanese. The Chinese consider the toasted seeds to be tonic and diuretic; they prescribe them in blennorrhagia.

The root is one of the ingredients in Vagbhata's snake remedy Ashtanga-agada; but Mhaskar and Caius have shown experimentally that the drug is not an antidote to snake venom.

Arabic: Damudud—; *Ashanti*: Akrokosaibia—; *Assam*: Koamonee, Sohriu—; *Balaghat*: Gurlu—; *Bengal*: Gurgur, Jilgurgur, Julgurgur, Kunch—; *Bombay*: Gurgur, Kardia, Kassaibija, Kassar, Keruch, Ranjondhla, Ranmaka—; *Bundelkhand*: Ganddula, Garun—; *Burma*: Cheik, Kalithi, Kyeikphun, Kyeit, Sakyeik—; *Cachar*: Jhonki—; *Central Provinces*: Galbi, Ganddula, Kasei—; *Chanda*: Gadi, Galbi, Kasei—; *Chinese*: I I Jen, Kiai Li, T'u I Mi, Y I Mi—; *Cutch*: Dhamra—; *Egypt*: Dimma ayub—; *English*: Christ's Tears, Job's Tears—; *Fiji*: Sila—; *French*: Larme de Job, Larmillé des Indes—; *Gond*: Kasai—; *Gujerati*: Kasai, Ranzondlo—; *Hindi*: Baru, Dabhir, Ganduta, Garahadua, Gargaridhan, Garun, Gulbigadi, Gurlu, Jilgurgur, Julgurgur, Kaiya, Kansh, Kasei, Sanklu, Sankhru, Sankru—; *Igorotte*: Agda—; *Indo-China*: Bo bo hoang, Cuom gao, Neang vong, Y di—; *Jaintia Hills*: Sohriu—; *Japan*: Judsudama, Tomugi—; *Karen*: Be, Bema—; *Khasia Hills*: Sohriu, U sohriew—; *Konkani*: Ranzondlo, Ranzonnalo—; *La Reunion*: Job—; *Lepcha*: Kun-dap, Tung-lin—; *Lushai Hills*: Mim—; *Malay*: Jilai batu, Mulai tikus, Ringuiringui—; *Malaya*: Yee mai, Yee yin—; *Malta*: Dmuh ta Giobb, Hara tac Ciaul, Job's Tears, Lacrima di Giobbe, Zibeg tal curum—; *Manipur*: Changmimkhombi, Mim, Mung—; *Marathi*: Ranjondhala, Ranmakkai—; *Matheran*: Kasai, Ranmaka—; *Mexico*: Acayacoyotl—; *Mount Abu*: Dabhir—; *Mundari*: Bakrihoreng, Horeng, Loeonghoreng—; *Naga Hills*: Kasi, Kesi, Koasangti, Kudhati, Kudhiathia, Sikrakravu, Sotsa—; *New Caledonia*: E'Houa—; *North-West Provinces*: Sankru—; *Philippines*: Alimodias—; *Poona*: Jondhali—; *Porto Rico*: Camandula—; *Portuguese*: Lagrimas de Job—; *Punjab*: Sanklu—; *Rajputana*: Dabhir—; *Ranchi*: Danghir—; *Sabathu Hills*: Sanklu—; *Saharanpur*: Baru—; *Samoa*: Maniusniu, Samasama—; *Sanskrit*: Gaberu, Gavedhu, Gavedhuka, Gavedu, Gojivha, Gundraguttha, Jargadi, Kshudra, Kunta—; *Santali*: Jargadi—; *Sema*: Akiti—; *Seoni*: Galu—; *Sierra Leone*: Boukon, Boukori, Ewaruwura, Kali bugi—; *Sinhalese*: Karibu, Kikirindi, Kikirindimana, Kukirrindi—; *Spanish*: Lagrimas de San Pedro—; *Tagalog*: Tegbe, Tigbi—; *Tamil*: Kattu-kundamani—; *Twi*: Owu-ammang-mankang-m'asaim—; *Uruguay*: Lagrima de Cristo, Lagrima de Job, Lagrima de Maria—; *Visayan*: Adlay—.

Cymbopogon.

This genus consists of about 36 species distributed throughout the tropical, and more rarely the subtropical, regions of the Old World.

C. winterianus Jowitt is officinal in Germany.

C. schoenanthus Spreng. is used medicinally in China, Guinea, Madagascar and Guiana; *C. nardus* Linn. in Cambodia, Guinea and Madagascar; *C. citratus* Stapf. in the Gold Coast; *C. excavatus* Stapf., *C. marginatus* Stapf., *C. validus* Stapf. in South Africa.

A. Basal leaf-sheaths ultimately loosened and curled; blades flat; raceme-fascicles compound ... 1. *C. jwarancusa.*

B. Basal leaf-sheaths in dense tufts, tightly clapping, thickened below; blades more or less filiform and flexuous, except when very short; raceme-fascicles more or less simple ... ... 2. *C. schoenanthus.*

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C. Sessile spikelets lanceolate or ovate- or obovate-lanceolate; back flat. Lowest pedicel of raceme scarcely stouter than the upper. All the spikelets awnless ... ... 3. *C. nardus.*

D. Sessile spikelets linear to lanceolate-linear, awnless; back distinctly concave in the lower part; panicle usually loose; branches slender, the ultimate branchlets more or less nodding; spathes long and narrow; hairs of joints and pedicels rather spreading ... ... 4. *C. citratus.*

1. **Cymbopogon jwarancusa** Schult. (=*Andropogon jwarancusa* Jones) is found in the outer hill zone of the United Provinces, Kumaon, Garhwal, and westwards as far as Peshawar, Jodhpur and Jaisalmer, Sind, Bihar. It occurs in Western Tibet, ascending to 8,000 ft., and extends westwards to North Africa.

The plant is described by both Ayurveda and Yunani writers.

This grass is used to purify the blood, and in coughs, chronic rheumatism and cholera. It is recommended as a valuable aromatic tonic in dyspepsia, especially that of children. It is also used as a stimulant and sudorific in gout, fever and rheumatism.

The flowers are astringent and are used to stop haemorrhage.

When a Baluchi has fever, a large quantity of this grass is collected and made into a bed. He lies on it and at once begins to sweat.

Arabic: Izkhair—; *Baluchi*: Haveh—; *Bengal*: Gandhavena, Ibharankusha, Karankusa—; *Bombay*: Ibarankusa, Iwarankusa, Izkhir, Kurankusa—; *Brahui*: Have, Haveh—; *Canarese*: Kari lavancha—; *Gujerati*: Jalavalo, Khadajala, Pilovalo—; *Hindi*: Bur, Ghatyari, Ibharankusha, Karankusha, Khavi, Khawi, Khoi, Lamjak, Panni, San, Solara—; *Marathi*: Izkir, Lavaja, Pivalavala—; *North-West Provinces*: Bad, Ganguli, Misiyaban, Piriya—; *Persian*: Gurgiyah—; *Punjab*: Bur, Ghatyari, Ibharankusha, Karankusha, Khavi, Khawi, Khoi, Lamjak, Panni, San, Solara—; *Sanskrit*: Amrinala, Avadahaka, Avadataka, Dirghamula, Isthakapathika, Jalashaya, Jwarankusa, Laghu, Lamajjaka, Laya, Nalada, Sevya, Shighra, Sunala, Sunila—; *Tongking*: Co de—.

2. **Cymbopogon schoenanthus** Spreng. (=*Andropogon schoenanthus* Linn. = *A. laniger* Desf.) is found in the hotter parts of India, wild or cultivated, from the Punjab to Burma and southwards to Travancore and Ceylon. It extends to Afghanistan and through North Africa to Morocco; it also occurs in Eritrea, Socotra and Somaliland.

Ayurvedists describe the grass as acrid, bitter and pungent; useful in fevers, bronchitis, pains, leprosy, heart and throat troubles, and epileptic fits in children.

In Mahomedan medicine it is prescribed as a diuretic, emmenagogue and deobstruent, also as a stimulant to promote perspiration and expectoration.

A decoction of the plant is given as a febrifuge. It is used in China against oppression and spasmodic dyspnoea.

A strong infusion of the grass is commonly used in Egypt as an antispasmodic and diuretic, and is reputed to have valuable results, especially in promoting the passage of urethral stones.

The oil is considered a powerful stimulant when applied externally. It is used as a liniment in chronic rheumatism and neuralgia, and is believed to have the property of curing baldness.

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The root and the stem are popular snake and scorpion remedies; but Caius and Mhaskar have demonstrated experimentally that both of them are useless in the antidotal treatment of either snake bite or scorpion sting.

Arabic: Izkhir, Mahareb—; *Bengal*: Agyaghas, Gandhabena, Kamakarpura—; *Bicol*: Baliyoc—; *Bombay*: Rohisha, Rosegavat—; *Cairo*: El-mahareb—; *Canarese*: Vasanchullu—; *Ceylon*: Camel Grass—; *Chinese*: Cha Yang, Cho Yang, Mao Hsiang, Yang Mao Ts'ao—; *English*: Camel Grass, Camel Hay, Geranium Grass—; *French*: Barbeau musqué, Chiendent musqué, Foin de chameau, Gramen oriental, Jonc odorant, Pâture de chameau, Schoenanthe, Schoenanthe odorant—; *French Guiana*: Citronnelle—; *Fort Sandeman*: Sargarah—; *Gujerat*: Roshdo, Roshgas, Rusaghas, Rush, Rushgas—; *Hassan*: Ezkryr—; *Hedjaz*: M'haz, Ulfaz udwiyah—; *Hindi*: Bujina, Ghandhabela, Ghatyari, Gundbel, Khavi, Mirchiagand, Musel, Palakhari, Rohisha, Rousaghas, Saundhiya—; *Hova*: Fiahana, Fiahina, Fiehana, Verofehana, Veromanitra—; *Italian*: Fieno di camelo—; *Jhalawan*: Hawai—; *La Reunion*: Citronnelle—; *Las Bela*: Pui—; *Malayalam*: Sirek—; *Marathi*: Rohisha, Rosegavat, Rushgavat—; *Matheran*: Rusha—; *New Caledonia*: N'Dowi—; *North-West Provinces*: Bujina, Palakhari—; *Persia*: Gorgiyah—; *Philippines*: Paja de meca, Raiz de moras, Salaid—; *Punjab*: Ranus, Rauns—; *Sanskrit*: Bhustrina, Bhuti, Bhutika, Devajagdha, Dhupagandhika, Dhyama, Dhyamaka, Katrina, Paura, Putimugdala, Rohisha, Rohishatrina, Saugandhika, Shyamaka, Sugandhatrinashita, Sushitala—; *Shahrig*: Sargarah—; *Siwaliks*: Mirchiagard—; *Spanish*: Esquenanto, Paja de camello, Paja de la Meca—; *Tagalog*: Salai, Salay, Tanglad—; *Tamil*: Kamachipillu, Kavatampillu, Vassinapillu—; *Teheran*: Azkar—; *Telugu*: Kamachikussu—; *Visayan*: Tanglad—.

3. **Cymbopogon nardus** Linn. (=*Andropogon nardus* Linn.) occurs throughout the hotter parts of India, Burma, the Malay Peninsula, and Ceylon, wild or cultivated, common everywhere. It extends to tropical Asia, Africa and Australia.

The infusion of the leaves is used as a stomachic and carminative.

The oil is stimulant, carminative, antispasmodic and sudorific. It is used as rubefacient.

In Cambodia the flowers and the leaves are considered good against cough, and sudorific; the roots are used as a diuretic, sudorific and antiperiodic.

Bengal: Kamakher, Kurankosha—; *Burma*: Singoumia—; *Cambodia*: Sakrey, Slek Rey—; *Canarese*: Gandahanchikhaddi, Kamakshihullu—; *Deccan*: Ganjni—; *English*: Citronella Grass—; *Hindi*: Ganjni, Ganjnikaghas, Iwarankosa, Pustburn—; *Hova*: Verofehana—; *Indo-China*: Citronnelle, Hung nghe huyen, La sa, Satrey—; *Malay*: Sereh wangi—; *Malayalam*: Chorapulla, Kamakshipulla—; *Marathi*: Ganjni, Usadhana—; *Sinhalese*: Maana, Mana, Pengirimana, Watusaewendara—; *Spanish*: Espicanardo espurio—; *Tamil*: Kavattampillu, Kamachipillu, Mandappillu, Sukkunaruppillu, Sunnarippillu—; *Telugu*: Kamakshikasuvu, Kamachikussu, Kamanchigaddi—; *Zulu*: ubungu—.

4. **Cymbopogon citratus** Stapf. (=*Andropogon citratus* D.C.) is only known in the cultivated state. Probably of Indian origin it is now widely distributed over the tropics of both hemispheres.

Ayurvedists describe the grass as pungent, bitter, sharp and hot. They say it is a good laxative, an aphrodisiac and anthelmintic; useful in bronchitis, leprosy and epileptic fits.

An infusion of the leaves is a popular sudorific, stimulant, antiperiodic, very frequently given in simple catarrh. As a fever drink it has great effect in inducing a remission or intermission by bringing on sweat; and it is especially successful with weakly

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subjects or when the fever is of a typhoid type. It is also used as a medicinal vapour bath in mild cases of fever, or as an inhalation.

The roots and tender leaves are sometimes given with black pepper in cases of disordered menstruation and in the congestive and neuralgic forms of dysmenorrhoea.

In flatulent and spasmodic affections of the bowels, and in gastric irritability, the oil is a remedy of value. In cholera it proves very serviceable, not only by allaying and arresting the vomiting, but by aiding the process of reaction as well. Applied externally, it forms an excellent embrocation in chronic rheumatism, neuralgia, sprains and other painful affections. Externally it is also used for the ringworm.

In the Gold Coast the leaves are often boiled in water like tea, and the liquor is drunk to cure fever. It is sometimes put into hot bath water, and the patient stands in the hot vapour given off. This is also said to be a good cure for fever.

Bengal: Gandhabena—; *Burma*: Sabalin—; *Canarese*: Kavanche hullu, Majjigehullu, Purhalihulla, Vasanehullu—; *Chinese*: Mao Hsiang—; *Colombia*: Limoncillo—; *Deccan*: Hazarmasalah—; *English*: Lemon Grass, Melissa Grass—; *French*: Chiendent citronnelle, Verveine des Indes Orientales—; *Gujerati*: Lilacha, Lilicha—; *Hindi*: Gandhatrina—; *Indo-China*: Huong mao thao, La sa, Sacrey, Say sa—; *Java*: Sireh—; *Malay*: Sereh makan—; *Malayalam*: Shambharapulla, Vasanappulla—; *Marathi*: Hirvacha, Olancha, Olencha—; *Persian*: Chaekashmiri, Hazarmasalah—; *Portuguese*: Herba cheirosa, Capim de Cheiro—; *Sanskrit*: Abichhatraka, Atigandha, Badhira, Badhiradhvanibodhana, Bhustrina, Bhutina, Chhatra, Gochhalaka, Guchhala, Guhyabija, Gundardha, Jambukapriya, Karenduka, Kutimbaka, Malatrinaka, Punsvavighraha, Putigandha, Roshisha, Samalambi, Shringaroha, Sugandha—; *Sinhalese*: Penquin, Saira—; *Spanish*: Grama de limon, Limoncillo—; *Tagalog*: Tanglad—; *Tamil*: Karapurappillu, Vasanappillu—; *Telugu*: Chippagadi, Nimmagaddi, Vasangaddi—; *Venezuela*: Citronera, Limonera, Malojillo—.

Cynodon.

Of the 7 species which constitute this genus, 1 is cosmopolitan, the others Australian and South African.

C. dactylon Pers. is used medicinally in Madagascar, La Reunion and South Africa; *C. hirsutus* Stent. in Basutoland.

C. bradleyi Stent. yields hydrocyanic acid.

Cynodon dactylon Pers. is cosmopolitan and distributed through all warm countries. It is found throughout India, Burma and Ceylon, ascending to 5,000 ft. in the Himalaya.

A decoction of the root is chiefly used as a diuretic in South India and in Chota Nagpore. In Mysore it is employed for secondary syphilis.

The cold infusion of the root often stops bleeding from piles.

The roots crushed and mixed with curds are a Deccan remedy for chronic gleet.

The expressed juice of the plant is an Ayurveda specific for hysteria, epilepsy and insanity.

The expressed juice of the plant, however, is a popular astringent commonly used as an application to fresh cuts and wounds and given internally in cases of chronic diarrhoea and dysentery.

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It is also diuretic and used in cases of dropsy. It has moreover been found useful in catarrhal ophthalmia.

In the Konkan the grass is prescribed in compound decoctions with more active drugs for the cure of dysentery, and abnormally profuse menstruation. A white variety, which appears to be only a diseased state of the plant, is used medicinally by the native Hindu practitioners. It is acidulous and is given to check vomiting in bilious complaints.

A preparation of the plant is applied by the Santals in a parasitic disease, which attacks the spaces between the toes.

In Madagascar the whole plant, or the rhizome alone, is applied specially in gout and rheumatic affections.

An infusion of the plant is taken as a tonic in Venezuela.

Europeans in the Transvaal use the plant for heartburn. It is taken bruised and mixed with sodium bicarbonate and other substances. The bruised plant alone is applied as a styptic to wounds.

The Xosas use a decoction as a lotion for sores and swellings.

Mhaskar and Caius have shown that the plant is not an antidote to either snake venom or scorpion venom.

Afrikaans: Batawiese kweek, Fynkweek, Kwagga, Kwaggakweek, Kruisgras, Oostindiese kweek—; *Antsianaka*: Arampandroira—; *Arabic*: Nagil—; *Baluchi*: Milinu—; *Bengal*: Dub, Dubla, Durba—; *Betsileo*: Kindrese—; *Bombay*: Harala, Haryeli—; *Canarese*: Garikehullu, Karkeri hullu, Kudi garikai—; *Catalan*: Agram, Gram—; *Central Provinces*: Dhupsa, Hariali—; *Chinese*: Ko Oung—; *Cuba*: Grama—; *Cutch*: Chhabar, Chhabbar—; *Egypt*: Nediil, Negil, Nishil, Nisiil—; *English*: Bahama Grass, Bermuda Grass, Couch Grass, Creeping Panic Grass, Devil's Grass, Doab Grass, Dog's Tooth Grass, Doob Grass, Doorwa, Doub Grass, Dun Grass—; *French*: Chiendent pied de poule, Gros chiendent, Herbe des Bermudes, Pied de poule—; *Greek*: Agria, Agriada—; *Guam*: Grama—; *Gujerat*: Dhro, Dhrokad, Gharo, Khabbal—; *Hausa*: Kiri kiri, Tsar-Kiyar zomo, Tsirkiar zomo—; *Hawaii*: Manienie—; *Hindi*: Dhoboghas, Dub, Dubra, Durba, Huriyale, Kalighas, Kabbar, Ramghas—; *Hova*: Fandrotararana—; *Indo-China*: Co chi trang, Co ong, Hanh nghi chi—; *Iraq*: Thaiyil—; *Jhalawan*: Char, Chobi, Godmaz—; *Kolami*: Dhobighas, Dubi—; *Konkani*: Dhurva, Harialy—; *Languedoc*: Limaouça—; *Lao*: Ya Pet—; *Las Bela*: Sabah—; *Loanda*: Capim dos caballos—; *Loralai*: Sabah—; *Madagascar*: Kindresy—; *Malta*: Capriola, Couch Grass, Doub Grass, Gramigna, Nigem—; *Marathi*: Dhurva, Durva, Harialy, Karala—; *Menabe*: Fandrahana—; *Mundari*: Dubila, Dubilatasad, Dubitasad—; *Nairobi*: Uganda Grass—; *Nisirabad*: Kabb—; *North-West Provinces*: Duba, Kalighas, Ramghas—; *Pacific Coast*: Bermuda Grass, Dog's Tooth Grass, Indian Couch Grass, Scotch Grass, Wire-Grass—; *Panjgur*: Shez—; *Punjab*: Daurva, Dun, Dubra, Kabbar, Khabbal, Talla, Tilla—; *Rajputana*: Dob, Nilldub—; *Rarotonga*: Mati—; *Sadani*: Dublaghas—; *Sakalave*: Fandrotsana, Fandrotsarana—; *Sanskrit*: Amari, Amrita, Ananta, Anuvallika, Asitalata, Bahuvirya, Bhargavi, Bhutahantri, Dhurta, Dhurva, Durmara, Gauri, Guna, Harasalika, Harita, Haritali, Jaya, Kachharuha, Mahaushadhi, Mahavari, Mangala, Nanda, Niladurva, Ruha, Sahsravirya, Saumya, Shadvala, Shambhavi, Shanta, Shashpa, Shataparva, Shatagranthi, Shatavalli, Shatmula, Shita, Shitakumbhi, Shitala, Shiva, Shiveshta, Shyama, Tiktaparva, Vamini, Vijaya—; *Santali*: Dhobighas, Dubi—; *Sind*: Chhabar, Chhabbar, Chibbur—; *Sokoto*: Kirikiri, Tsarkryarzomo, Tsirikiarzomo—; *South Africa*: Bahama Grass, Bermuda Grass, Bermuda Quickgrass, Devil's Grass, Doab Grass, Dub Grass, Fine Couchgrass, Florida Grass, Germiston Grass, Scotch Grass—; *Spanish*: Grama común—; *Suto*: Mohlwa, Morara—; *Tagalog*: Cautcauran, Colatay, Malit—; *Tamil*: Arugampillu, Hariali—; *Tasmania*: Indian Couch—; *Telugu*: Ghericha, Gurka hariali—; *Trans Indus*: Burawa—; *Transvaal*: Quagga Quick—; *Upper Godavery*: Haryali—; *Urdu*: Dub—; *Uriya*: Dubbulaghanso—; *Uruguay*: Gramilla, Gra-

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milla colorada, Gramilla del tiempo, Pata de perdiz—; *Virginia*: Wire Grass—; *West Indies*: Bahama Grass—; *Xosa*: uQuaqaqa—; *Zulu*: isiNandi, umFulwane, uNgwengwe—.

Dactyloctenium.

The genus consists of 5 species inhabiting warm regions, one widely spread throughout the tropics.

Dactyloctenium aegyptium Rich. (=*Eleusine aegyptiaca* Desf.) is spread throughout the low country of India and Burma, to Malacca and Ceylon. It is also known from Egypt, Nubia, Eritrea, Arabia and other countries of Tropical Asia and America. It was introduced into the New World from the warm regions of the Old.

The grains are used medicinally by the Mundas of Chota Nagpore; they are parched in an earthern vessel and consumed in small doses for three to eight days by women who after childbirth suffer from belly-ache.

A decoction of the seeds is renowned in Africa as an alleviator of pains in the region of the kidney, and its herbaceous parts are applied externally for the cure of ulcers.

Annam: Co chi trang—; *Australia*: Egyptian Finger Grass—; *Bombay*: Mhar, Nachani, Nagli, Natchni, Raj—; *Bundelkhand*: Makamakna, Tipakia—; *Central Provinces*: Chikara, Chotamandiya, Mathna, Utesirkum, Utesirla—; *Egypt*: Im-es-salib, Rigl-el-herbayeh—; *English*: Goose Grass—; *Hausa*: Gudegude—; *Hindi*: Makra, Makri—; *Malayalam*: Kavarapullu—; *Mundari*: Bulungcuri, Bulungkode, Bulungruti, Bulungrutui—; *Natal*: Inane—; *Philippines*: Salai maya—; *Punjab*: Bhobra, Chimbari, Chubrei, Karmadhana, Madana, Madhana—; *Rajputana*: Malicha, Maligha, Mansa—; *Sadani*: Nonmarua—; *Santali*: Suntubukrui—; *Sinhalese*: Putatana—; *South Africa*: Coast Grass, Duck Grass—; *Tagalog*: Alam—; *Tamil*: Sodi, Tamida—; *Telugu*: Muttengapillu—; *Transvaal*: Egyptian Kweek-grass, Natal Kweek-grass—; *United States*: Comb Fringe Grass, Crowfoot Grass, Little Crowfoot—; *Uriya*: Kakuriya—; *Zulu*: isiNandi, isInane, uNgwengwe—.

Dendrocalamus.

This genus numbers 24 species, which inhabit the Indo-Malayan region, the Philippine Islands, China and Africa.

Dendrocalamus strictus Nees is found in the dry hills of Northern India, from Garhwal to Nepal and southwards from the Punjab to Bihar, the Konkan, Central and South India, Burma and Great Cocos Island. It extends to Java.

The leaves are boiled in water for convalescents to bathe in.

A decoction of the leaves is given to aid parturition; the juice in two-ounce doses taken frequently is used as an abortifacient.

In Arabia the joints are made into a decoction and used as a medicine to procure abortion.

The minute hairs found on the sheath leaves are used by the Malays as a poison; it is given either alone or in combination with other things.

Baigas: Bhiru—; *Bengal*: Karail—; *Bombay*: Bas, Bassa, Kaban, Udha, Vassa—; *Burma*: Myinwa—; *Canarese*: Bidiru, Gandubediru, Kibbidary, Kiribidiru—; *English*: Male Bamboo, Solid Bamboo—; *Gond*: Halpa, Vadur, Veddar—; *Gujerat*: Nakorvans, Narvans, Vans—; *Hindi*: Bans, Banskaban,

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Banskhurd, Kopar, Lakdibans, Narbans—; *Khond*: Maringi—; *Kolami*: Burumadh, Burumat, Mathan, Saring—; *Kumaon*: Bans—; *Kurku*: Indo—; *Lambadi*: Vasi—; *Malay*: Buloh batu, Buloh berang, Buloh tempat—; *Malayalam*: Arinkantam, Cheriyamula, Kalmula, Kalmungil, Karinalimula, Karinkana—; *Marathi*: Bans, Bharilvel, Bhovarlit, Vela—; *Mundari*: Birmad, Burumad, Janggimad—; *Palamow*: Bukhar—; *Pandratola*: Kark—; *Reddi*: Kondaveduru—; *Sanskrit*: Vansha, Venu, Yavaphala—; *Santal*: Burumadh, Burumat—; *Saora*: Kondaveduru—; *Tamil*: Karanai: Kalmungil, Kattumungil, Mungil, Sinnamungil, Sirumungil, Siruvari—; *Telugu*: Chittiveduru, Gattiveduru, Kankaveduru, Penveduru, Potuveduru, Rativeduru, Sadanapaveduru, Sannaveduru, Veduru—; *Thana*: Bundi, Manwel—; *Tulu*: Lavakiri, Panjibedru—; *Uriya*: Saliabans, Saliabhanso, Salimbo, Salimbobaunso, Salimbo bhanso, Sanobaunso—.

Desmostachya.

The only species of the genus is **D. bipinnata** Stapf. (=*Eragrostis cynosuroides* Beauv.). It is found in the plains of India, from Peshawar and Sind to Burma and southwards, in hot dry places. It extends westwards to Syria, Egypt, Nubia and East Tropical Africa.

The culms are diuretic and stimulant. In the Konkan they are prescribed in compound decoctions with more active drugs for the cure of dysentery, and profuse menstruation.

Afghanistan: Drab, Kuthag—; *Bengal*: Kusha—; *Bolan*: Drab—; *Bombay*: Darbh—; *Brahui*: Drak—; *Bundelkhand*: Dabvi—; *Central Provinces*: Chir, Dabhat, Kusha—; *Egypt*: Ambarfe, Halfa, Hamarte, Gash—; *Gazechah*: Kuthag—; *Gujerati*: Dabha, Darabha—; *Hindi*: Dab, Davoli, Durva—; *Kani*: Kuthag—; *Kila Saifulla*: Sparmaghaz—; *Libya*: Halfa—; *Marathi*: Darbha—; *North-Western Provinces*: Dab, Daboi, Dhab, Kush—; *Punjab*: Dab, Dhab, Dib, Drab, Drabh, Kusa—; *Sanskrit*: Barhi, Darbha, Durbha, Garbha, Hrasva, Kurava, Kusha, Kutha, Kutupa, Pavitra, Suchyagra, Yajnabhushana—; *Shahrig*: Dab—; *Sibi*: Drab—; *Telugu*: Aswalayana, Dabha, Darbha, Durpa, Kusadarbha—; *Turbat*: Ding, Drab—.

Echinochloa.

This genus consists of 20 to 25 species distributed throughout the warm regions of both hemispheres.

E. colona Link. var. *frumentacea* Blatter and McCann, and *E. crus-galli* P. Beauv. are used medicinally in China.

1. Upper involucral glume and lower floral glume equally acute or cuspidate ... ... *E. colona.*
2. Upper involucral glume and lower floral glume cuspidate or produced into an awn, the latter more than the former. Ligule absent ... *E. crus-galli.*

1. **Echinochloa colona** Link var. **frumentacea** Blatter & McCann (=*Panicum frumentaceum* Roxb.) is cultivated over the greater part of India, up to 6,500 ft. on the Himalaya.

The plant is said to be a good remedy useful in biliousness and constipation.

America: Billion Dollar Grass—; *Baluchi*: Samako—; *Bengal*: Samrashama, Sanwa, Saon, Shama, Shamula, Syamadhan—; *Bihar*: Sama, Sanwan, Sawan—; *Bombay*: Bavto, Sama, Samuka, Sanwak, Shama—; *Canarese*: Same, Save—; *Central Provinces*: Sawa, Sema—; *Chinese*: Shan Tzu—; *Deccan*: Kangra, Kathi, Kathli, Sanwa, Saon, Sawa Shama, Shamula—; *English*: Japanese Barnyard Millet—; *Garhwal*: Jhungara—; *Gujerat*: Samo, Samoghas, Janglisamak—; *Hindi*: Samak, Sanwa, Sawa, Sawan, Shama, Shamula—; *Kashmir*: Karin, Soak—; *Khondmals*: Jhari—; *Kumaon*: Jhangora,

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Koni, Kungni, Mandira—; *Malay*: Padi burong—; *Marathi*: Janglisama, Samul—; *North-Western Provinces*: Jhungara, Saman, Sawan—; *Oudh*: Sama, Samei, Sanwan, Sawan, Sawanbhadeha—; *Persian*: Bajri—; *Punjab*: Chandra, Sama, Samuka, Sanwak, Sawank, Soak—; *Sanskrit*: Avipriya, Rajadhanya, Shyama, Shyamaka, Sukumara, Tribija, Trinabijottama—; *Sind*: Saon, Saron—; *Sinhalese*: Welmarukku—; *Tamil*: Kudraivallipillu, Railpillu—; *Telugu*: Bontachamalu, Bontashama, Bonthshama, Chama, Chamalu, Pala oodalu, Sawa—; *Uriya*: Samu—.

2. **Echinochloa crus-galli** P. Beauv. (=*Panicum crus-galli* Linn.=*P. crus-corvi* Linn.) is common throughout the greater part of India and Malaya; as a weed it is found throughout the warm temperate countries of the northern hemisphere. It is somewhat rare in the tropics of Africa and the New World, and south of the Tropic of Cancer.

The plant is used to check haemorrhage, and is prescribed for diseases of the spleen.

Australia: Barnyard, Cockspur Grass—; *Baluchi*: Samo—; *Bengal*: Burashama, Dul—; *Betsileo*: Ahibary, Aibary—; *Bombay*: Borur, Jiria, Pakud, Pakushama, Sawank, Todia, Tor—; *Canarese*: Kadu dabhai hullu—; *Central Provinces*: Baribhodore, Bharta, Datia, Kondabuttamgodi—; *Chinese*: Pai—; *Dutch*: Vingergras—; *Egypt*: Dineyb—; *English*: Panic Grass—; *French*: Crête de coq, Ergot de coq, Millard, Panis des marais, Panis pied de coq, Patte de poule, Pied de coq—; *German*: Hahnenfussfennich—; *Greek*: Kechri—; *Gujerat*: Adbausamo—; *Hindi*: Samak, Sanwak—; *Hova*: Farimanga, Tsimparifarifolsy, Tsimparifarifary, Tsimparifarimango, Tsimparifarimena—; *Iraq*: Dahnan, Danan, Dukhain—; *Italian*: Cresta de gallo—; *Malta*: Panickgrass, Cock's shin Grass, Panicastrella, Xrika—; *Marathi*: Sama—; *Mundari*: Camatasad, Iri—; *North-Western Provinces*: Dhand, Jalsawank—; *Punjab*: Barasanwak, Bharti, Dhand, Jarotha—; *Rajputana*: Horma, Sama, Siwan—; *Roumanian*: Bujorul—; *Sadani*: Sauna, Sawa—; *Sakalave*: Karangy—; *Sanskrit*: Jalasamaka—; *Spanish*: Daza, Mijo—; *Tagalog*: Dauadaua—; *Teulgu*: Peddawundu—; *United States*: Barnyard Grass—; *Uruguay*: Pata de gallo—.

Eleusine.

This genus consists of 10 species distributed over the warm regions of the eastern hemisphere, one being widely spread throughout the tropics.

E. coracana Gaertn. is used medicinally in South Africa, *E. indica* Gaertn. in Guiana and Cambodia.

1. Spike stout, often incurved, pubescent at base. Seed globose ... ... *E. coracana.*
2. Spike slender, nearly glabrous at base. Seed oblong, obtusely trigonous ... ... *E. indica.*

1. **Eleusine coracana** Gaertn. is cultivated throughout India and in many parts of tropical Africa and tropical Arabia.

Ayurveda authors describe the grain as acrid, bitter and sweet and cooling. They consider it tonic, and recommend it in biliousness and blood diseases.

The grain is generally used as an astringent.

In South Africa the Tongas and Shangaans use it along with *Plumbago zeylanica* Linn. as an internal remedy for leprosy.

Abyssinia: Talban—; *Bengal*: Marua, Murha—; *Bombay*: Nagli, Nangli—; *Canarese*: Raggi, Ragi—; *Egypt*: Bishna—; *Eritrea*: Dagussa—; *French*: Coracan, Eleusine coracana—; *Golungo Alto*: Luco, Lucu—; *Gujerati*: Bavtonagli, Navtonagli—; *Hadramaut*: Dokhn—; *Hausa*: Tamba—; *Hindi*: Makra,

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Mandua, Marua, Maud, Murua, Rotka—; *Katagum*: Tamba—; *Khasi*: U'raitruh—; *Kolami*: Kode—; *Konkani*: Gonddo, Nachno—; *Malayalam*: Chettipulli, Mutami—; *Marathi*: Nachiri, Nagli—; *Mundari*: Dasaikode, Dumbakode, Kode—; *Natal*: Upoko—; *Nile*: Ooleyzei—; *Northern Nigeria*: Tomba—; *North-West Himalayas*: Koda, Kodon, Kodra, Kutra—; *North-West Provinces*: Makra, Mandua, Marua, Rotka—; *Oudh*: Makra, Mandua, Marua, Rotka—; *Persian*: Mandwah—; *Portuguese*: Nachinim—; *Punjab*: Chalodra, Koda, Kodon, Kodra, Mandal—; *Sanskrit*: Bahupatraka, Bhuchara, Guchha, Kadhina, Kanisha, Lanchhana, Maliyasa, Narttaka, Nrityakunda, Ragi, Raji, Rajika—; *Santali*: Kode—; *Shangaan*: Liphokho—; *Sind*: Nachni, Nangli—; *Sinhalese*: Kurakka—; *Tamil*: Kalvaragu, Kapai, Kayur, Ragi—; *Telugu*: Chodalu, Ponassa, Ragi, Ragulu, Sodi, Tamidelu—; *Unyoro*: Bolu—; *Uraon*: Kodai—; *Uriya*: Mandia—; *Zambesi*: Marumbi, Mitchinin—; *Zanzibar*: Vimbe—; *Zulu*: uPoko—.

2. **Eleusine indica** Gaertn. is found growing throughout the plains of India and Ceylon. It is common in the tropics of the Old World. It is naturalized in the Mediterranean region, and is said to have been introduced in the New World.

The whole plant, but more especially the root, is considered sudorific and febrifuge in Cambodia. It is much used in liver complaints.

In Guiana a decoction of the plant is given to children for convulsions.

Bundelkhand: Gurchawa—; *Burma*: Hsengnomyeet, Singnomyet—; *Cambodia*: Choeung Kras—; *Central Provinces*: Godchabba, Gurragadi, Kakariya, Madanya, Malghi, Mandial—; *Cuba*: Pata de gallina—; *French Guiana*: Pied de poule—; *Golungo Alto*: Pé de galinha—; *Guam*: Umog—; *Gujerat*: Adbaunagli—; *Hausa*: Chiyawartuji, Tuji—; *Hindi*: Malankuri—; *Katagum*: Chiyawar tuji, tugi—; *Kolami*: Bir Kode—; *Kumaon*: Mandavi—; *Lagos*: Ese-kana-kana, Gbegi—; *Malay*: Rumput sambau—; *Marathi*: Ran nachani—; *Mundari*: Kodai, Sukari kodai—; *North-Western Provinces and Oudh*: Gadha, Gadhacharwa, Gathamandwi, Jhingri, Jhinjhor, Lijhar, Makraila—; *Philippines*: Baquisquisan—; *Rajputana*: Mandwa—; *Sesuto*: Moseli—; *Shahrig*: Chhabal—; *Sierra Leone*: Osoekurunyi—; *Sinhalese*: Walkurakkan—; *South Africa*: Crowfoot, Goose Grass, Wild Rapoko Grass—; *Tagalog*: Sabongsabongan, Sambale—; *Tamil*: Thipparagi—; *Telugu*: Karuchodi, Karsodi, Kuror—; *Uganda*: Kasibanti—; *United States*: Goose Grass, Yard Grass—; *Uriya*: Nandia—; *Zulu*: uMunyankomo, umNyankomo, uPoko.

Heteropogon.

This genus consists of about 6 species found in the tropical and subtropical regions of the whole world.

H. contortus Roem. & Schult. is used medicinally in China and South Africa.

Heteropogon contortus Roem. & Schult. (=*Andropogon contortus* Linn.) is found in all warm regions. It is distributed throughout India, Burma and Ceylon to the Straits of Malacca, ascending the Himalaya to 5,000 ft. It is common throughout the whole Tropical Africa, and the adjacent islands, ascending in Eritrea to over 8,800 ft. It extends all over Africa, the Mediterranean region, and the tropical and subtropical regions generally.

The root is a stimulant and diuretic.

The Sutos of South Africa use the plant with *Tribulus terrestris* Linn. for the treatment of rheumatism in the hands.

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Afrikaans: Steek Grass—; *Bihar*: Chorant—; *Bombay*: Bal, Bale, Dakli-suckal, Italisuckal, Musaneh, Pendrisuckali, Suckal, Suckali kussal, Suckeri—; *Canarese*: Kari vunugada hullu, Sunkari hullu—; *Chinese*: Ti Chin—; *English*: Spear Grass, Wild Oats—; *Ga*: Akorsorfeng, Ananugangi—; *Gujerat*: Dhabsuliyum—; *Hausa*: Bunsurundaji—; *Hawaii*: Pili—; *Hindi*: Kher, Saral, Shurighas, Shurval—; *Ho*: Saiyu—; *Kharwar*: Chorant—; *Kohlu*: Barwu—; *Marathi*: Kant egawta—; *Matheran*: Bal, Kusal, Pandrisukal—; *Mundari*: Sauri—; *Ormara*: Abdarka—; *Sambalpur*: Sukla—; *Santali*: Saurighas—; *Sesuto*: Selokana—; *Shahrig*: Barwaz—; *Somaliland*: Aggar—; *Tamil*: Karunsipullu, Panipullu, Usipullu—; *Telugu*: Dubbagasarigaddi, Eddigaddi, Kaserigaddi, Yedda, Yeddi, Yerragoyi—; *Uriya*: Dauria, Sinkola, Sinkolo—; *Zulu*: isiTupe—.

Hordeum.

This genus numbers about 25 species, natives of temperate regions, mainly found in the northern hemisphere.

Hordeum vulgare Linn. is cultivated chiefly in North India and up to 13,000 ft. in the Himalaya. It is widely cultivated in all temperate regions.

Both Ayurveda and Yunani writers credit barley with antibilious, antispasmodic, and antifebrile properties, and recommend its use in the treatment of bronchitis.

Barley is demulcent, and easy of digestion, and is for these reasons used in the dietary of the sick. A powder of the parched grains is much employed in the form of a gruel in cases of painful and atonic dyspepsia.

In Patna the ashes of the leaf are employed in the formation of cooling sherbets. The ashes of the stalks are prescribed for indigestion in the plains of the Punjab.

From the earliest times barley has been employed to prepare drinks for the sick, especially in feverish disorders, and for sore lining membranes of the chest. Barley in the form of the decoction popularly known as *barley water*, affords a mucilaginous drink very valuable in all cases requiring demulcent treatment. Pearl barley is the form usually preferred for the preparation of the decoction, made by pouring four pints of boiling water on two Troy ounces of pearl barley and boiling away to two pints, and straining. It is especially used in infant feeding, as it seems to prevent the formation of large milk curds by its colloidal character.

Pearl barley is the seed deprived of all its investments and afterwards rounded and polished in a mill. It is in small round or oval grains, having the remains of the longitudinal furrow of the seeds, and of pearly whiteness. It is wholly destitute of hordein, and abounds in starch, with some gluten, sugar and gum. This is the proper form of barley for medicinal use.

Honey may be added beneficially to the decoction of barley for bronchial coughs. Barley water with gum arabic, one ounce of the gum dissolved in a pint of the hot decoction, is a very useful drink to soothe irritation of the bladder and of the urinary passages.

Barley meal is formed by grinding the seeds previously deprived of their husk. It may be made into a coarse, heavy,

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hard bread, which in some countries is much used for food, though apt to purge.

In China barley sprouts are especially prepared for medicinal use. This is done by moistening the grains with water, allowing them to germinate, and then drying them in the sun. The sprouts are rubbed off and the grain ground into flour. The sprouts enter into a number of prescriptions given for infantile complaints.

The germinated barley or malt with the radicle is used in China as peptic, stomachic, lenitive, demulcent and expectorant. Preparations of malt have acquired some reputation of late years in Europe and America, since they are more demulcent and nutritious than those of the unmalted barley.

Barley is officinal in France, Portugal, Spain and the United States of America.

Afghanistan: Jao, Jaoshirin, Jaotush—; *Arabic*: Shaair, Shair—; *Armenian*: Kari—; *Ashkobi*: Arbus—; *Bagwana*: Brehnajau—; *Behar*: Jowakhar—; *Bengal*: Jab, Jao, Jau—; *Bhotia*: Nas—; *Bombay*: Jav, Satu—; *Brazil*: Cevada, Cevada sancta—; *Burma*: Muyau—; *Canarese*: Javegodhi—; *Catalan*: Ordi, Ordi comú—; *Chinese*: Kung Mai, No Mai, Ta Mai—; *Danish*: Byg—; *Deccan*: Satu—; *Dutch*: Gerst—; *Egypt*: Shair—; *English*: Barley—; *Finland*: Ohva—; *French*: Béchette, Blé d'Egypte, Blé de mai, Epeautre, Epente, Epinte, Espigan, Orge, Orge commune, Orge grosse—; *German*: Garsten, Geste—; *Greek*: Krithari, Krithi—; *Gujerati*: Jau, Jav, Ymvah—; *Harboi Hills*: Jau, Sa, Urbusha—; *Hindi*: Jau, Jav, Jawa, Suj—; *Hungarian*: Arpa—; *Indo-China*: Dai mach, Lua mach nha, Ta me, Thoc mach nha—; *Iraq*: Sha'ir—; *Italian*: Farro, Orzo, Scandella, Spelita, Spelta—; *Jhalawan*: Jau, Sa, Urbusha—; *Kila Saifulla*: Jau, Sa, Urbusha—; *Konkani*: Cevad, Jav—; *Kurdish*: Ju—; *Languedoc*: Espeulto, Espigan, Feraje hordi, Ordi, Ordigal—; *Lapland*: Kordne—; *Lassa*: Soah—; *Malaya*: Mai ngai—; *Malta*: Barley, Orzo, Xghei, Xghei tal birra, Xghei tal mazza—; *Marathi*: Cevad, Jav, Java, Satu—; *Nepal*: Tosa—; *North-West Provinces*: Indarjau, Jau, Yurk—; *Persian*: Jao—; *Polish*: Jenczmien—; *Portuguese*: Cevada—; *Punjab*: Buza, Chak, Chang, Chung, Jaon, Jau, Jawa, Nai, Thanzatt—; *Roumanian*: Orz—; *Russian*: Jetschmen—; *Sanskrit*: Akshata, Dhanyaraja, Divya, Hayapriya, Hayeshta, Kanchuki, Medhya, Pavitradhanya, Praveta, Shaktu, Shvetashunga, Sitashuka, Sitrishuka, Tikshnashuka, Turagapriya, Yava, Yavaka—; *Sharig*: Jau, Sa, Urbusha—; *Spanish*: Cebada, Cebada común—; *Swedish*: Biugg—; *Tamil*: Barliyarisi, Barliyarishi—; *Tartary*: Arpah—; *Telugu*: Barlibiyam, Dhanyabhedam, Pachchayava, Yava, Yavaka, Yavala—; *Turkish*: Arpa—; *Urdu*: Jav—; *Yemen*: Schair—.

Hygrorhiza.

H. aristata Nees., the only species of this genus, is found in the upper and lower Gangetic Plains, Assam, Chittagong, Pegu, the Deccan and Ceylon, extending to Tongking. It occurs either floating on the surface of water, or creeping on wet ground.

Ayurveda describes the seeds as sweet and acrid, oleagenous, digestible and cooling. They are astringent to the urinary tract, and useful in biliousness. They cause constipation and flatulence.

Bengal: Uridhan—; *Bombay*: Deobhat, Urodhan—; *Canarese*: Jyarahumedhe—; *Gujerati*: Vanti—; *Hindi*: Janglidal, Tili, Tini—; *Malayalam*: Nirvallipullu—; *Marathi*: Deobhata—; *North-Western Provinces*: Parsal, Passahi, Passai, Passari, Tinni—; *Punjab*: Pastal—; *Sanskrit*: Aranyadhanya, Aranyajali, Munidhanya, Nivara, Prasadhika, Trinadhanya, Trinodbhava, Vanavrihi—; *Sinhalese*: Gojabba—; *Tamil*: Valli pullu—.

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IMPERATA.

This genus consists of 5 tropical species found in the warm regions of both hemispheres, but chiefly American.

Imperata arundinacea Cyrill. (=*I. cylindrica* Beauv.) is found in the hotter parts of India, from the Punjab southwards and eastwards, to Malacca and Ceylon. It grows in all warm countries and often covers enormous areas. When entering cultivated land it may become a serious pest.

The roots are used as an emollient in Cambodia, mostly in the fumigation of piles.

The roots are much appreciated in China for their restorative, tonic, haemostatic and antifebrile properties.

The Sutos of South Africa use the root in making a medicine for chest colds in children, while the Zulus regard it as a specific for hiccough.

Australia: Blady-grass—; *Baluchi*: Drug—; *Bengal*: Ulu—; *Bhabar*: Shiro—; *Bombay*: Dhub—; *Burma*: Thek-kay nyen—; *Cambodia*: Sbeou—; *Canarese*: Sanna dabbai hullu—; *Cantonese*: Pak mau kan—; *Chinese*: Mao Tsao, Pai Mao Ken—; *Hausa*: Tofa, Toba—; *Hindi*: Dabh, Siru, Ulu—; *Hova*: Tenina, Tenona, Tsevoka—; *Indo-China*: An do bach mao, Co danh, Mao ken, Tranh—; *Iraq*: Halfah, Shismallah—; *Kolami*: Chero—; *Malay*: Alang alang, Lalang—; *Malaya*: Pak mau kan—; *Mundari*: Huringciru—; *North-Western Provinces*: Shiro—; *Punjab*: Siru, Ulu—; *Sakalave*: Manevica—; *Sanskrit*: Balbajamu, Barhissu, Darbha—; *Santali*: Chero—; *Simla*: Dab—; *Sinhalese*: Iluk—; *Southern Nigeria*: Spear Grass—; *Suto*: Mohlabalerumo, Mohlorumo—; *Tamil*: Dharbai pul, Tharpaipillu—; *Telugu*: Barumbiss, Dharba, Modavagaddi—; *Uganda*: Lusanke—; *Upper India*: Bharwai, Sil, Sir, Usirh—; *Zulu*: umThente—.

LOLIUM.

This genus includes 6 species, natives of Europe, temperate Asia, and North Africa; but naturalised in many countries.

Many of the species are reputed to possess a poisonous principle.

Lolium temulentum Linn. is an annual weed of cultivation, also occasionally met with as a wayside weed and in waste ground, common in the plains and hills of the Upper Gangetic Plain, the Punjab, the North-West Provinces ascending to 4,000-6,000 ft. in the Himalaya, and Sind. It extends throughout Europe and Western Asia, has been found in the island of Madura and in North Africa, and occurs as an introduced plant in the United States and Australia.

The seeds or grains were used medicinally by the ancient Greeks and Romans. The old sages, however, supposed it to cause blindness, and with the Romans, *lolo victitare*, to live on Darnel, was a phrase applied to a dim-sighted person. Gerard says, 'The new bread wherein Darnel is eaten hot, causeth drunkenness'. A general trembling, followed by inability to walk, hindered speech, and presently profound sleep with subsequent headache and vomiting, are the symptoms produced by Darnel when taken in a harmful quantity.

'As it is not without some vices', says Culpeper, 'so hath it also many virtues. The meal of Darnel is very good to stay gan-

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grenes and other such like fretting and eating canker and putrid sores; it also cleanseth the skin of all leprosies, morphews, ringworms, and the like, if it be used with salt and raddish roots. And being used with quick brimstone and vinegar, it dissolveth knots and kernels, and breaketh those that are hard to be dissolved, being boiled in wine with pigeon's dung and linseed. A decoction thereof made with water and honey, and the places bathed therewith is profitable for the sciatica. Darnel meal applied in poultice draweth forth splinters and broken bones in the flesh. The red darnell boiled in red wine and taken, stayeth the lax and all other fluxes and women's bloody issues and restraineth urine that passeth away too suddenly.'

Darnel meal is still recommended as a sedative poultice, and is still believed to cure freckles.

Catalan: Juy, Sisanya—; *Devonshire*: Eaver, Iver—; *Dutch*: Bolderik, Dolik, Dravik—; *English*: Bearded Darnel, Cheat, Darnel, Jura, Ray Grass, Ryo Grass, Wary, Bragge, Cockle, Dornel, Dragge, Drake, Drank, Dravick, Droke, Drunk, Drunken Plant, Eaver, Ivray, Jum, Lover's Steps, Ray, Riely, Rivery, Sturdy—; *French*: Ivraie, Ivraie annuelle—; *German*: Lolch, Taumelkorn—; *Hindi*: Machni—; *Iraq*: Hanaitah, Ruwaitah, Shailam—; *Italian*: Gioglio, Loglio—; *Maltese*: Sicrana—; *Portuguese*: Joio—; *Roumanian*: Neghina, Selbata, Zizanie—; *Russian*: Plevel, Pshenetz—; *Somersetshire*: Devon Ever—; *Spanish*: Joyo, Zizaña—; *Sussex*: Crop—; *Uruguay*: Joyo, Trigollo, Zizaña—.

Lophatherum.

This genus consists of 2 species inhabiting Indo-Malaya, China and Japan.

Lophatherum gracile Brongn. is found in Tropical Himalaya from Sikkim eastwards, the Khasia and Naga Hills, and Ceylon up to 4,000 ft. It is common along forest paths in the whole Malay Peninsula from Singapore to Kedah, from the plains to 5,000 ft. altitude in the Thaiping Hills and Pahang. It extends to the waste land in China, Japan, Java, Amboyna and New Guinea.

In China the leaves are considered to have antifebrile and diuretic properties.

Annam: Co may, Dam chuc diep—; *Chinese*: Tan Chu—; *Malay*: Rumput jarang, Rumput Kelurat, Rumput ubi bulush—; *Sino-malay*: Tham chook—.

Manisuris.

The one species of this genus, **M. granularis** Sw., is found throughout the hotter parts of India, from the Punjab eastwards to Burma, and southwards to Ceylon. It occurs in most tropical countries.

Anislie says that in Behar the plant is prescribed internally in conjunction with a little sweet oil, in cases of enlarged spleen and liver.

Ajmere: Kangni—; *Berar*: Ratop—; *Chanda*: Agimaligadi—; *Gujerat*: Kasium, Kasiunghas—; *Hindi*: Kangni, Trimpali—; *Naguri*: Buruburuludiatasad, Ludiatasad—; *Rajputana*: Dhaturoghas—; *Sanskrit*: Palanggini—; *Sierra Leone*: Ardande, Fesifesi, Guisqui—; *Udaipur*: Dhaturoghas—.

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ORYZA.

This genus numbers about 17 tropical species extending to the subtropical regions of both hemispheres.

Oryza sativa Linn. is widely cultivated. It occurs indigenous in the marshes of Rajputana, Sikkim, Bengal, the Khasia Hills, Central India, the Circars and Pegu. It extends to Australia.

Ayurveda describes the rice grain as acrid, sweet, oleagenous, tonic, aphrodisiac, fattening, diuretic and useful in biliousness.

In India rice is used variously in sick diet. It is invariably ordered as the safest and best food in all dysenteric complaints. Boiled rice, when hot, is used as a poultice. Rice-water is recommended as an excellent demulcent, refrigerant drink in febrile and inflammatory diseases, dysuria and other affections requiring this class of remedies. This decoction is also given as an enema in affections of the bowels.

In Cambodia the husk of the grain is considered anti-dysenteric. The roasted grain, mixed with an equal amount of palm-sugar, is prescribed in *Strychnos* poisoning. Boiled in water and then dried in the sun, the grain enters into the composition of remedies for leprous ulcers.

Certain varieties of specially prepared grains are used medicinally in China and Malaya. Malted rice is used as a peptic, carminative and tonic.

In Europe the grain has long been considered to exercise pectoral virtues, and useful for persons troubled with lung disease, and spitting of blood, as in pulmonary consumption. 'The grain stays laxes and fluxes of the stomach and belly, especially if it be parched before it is used, and hot steel quenched in the milk wherein it is boiled, being somewhat drying and binding. The flour of the rice has the same property, and is put into cataplasms to repel humours from flowing to the place, and also to women's breasts to stay inflammations.'

Rice bread and rice cakes, simply made, are very light and easy of digestion. The gluten confers the property of rising, on dough or paste made of rice flour. But as an article of sustenance rice is not well suited for persons of fermentative tendencies during the digestion of their food, because its starch is liable to undergo this chemical change in the stomach.

The grain is officinal in Austria, Belgium, France, Germany, Great Britain, Holland, Italy, Portugal, Spain, Switzerland and Turkey.

Amblaw: Fala—; *Annam*: Lua nep, Lua nui, Lua song lon, Lua te, Lua toc—; *Arabic*: Arruz, Arz—; *Armenian*: Priusch—; *Belgaum*: Bhatta—; *Bengal*: Chal, Chanvol, Dhan, Oridhana—; *Bombay*: Bhatta, Dangar—; *Bouru*: Hala, Halai, Pala—; *Broach*: Dangar—; *Burma*: Chan, Saba, San—; *Cambodia*: Srau damnop, Srau khasai, Srau prapeai vea—; *Canarese*: Akki, Batta—; *Catalan*: Arros—; *Central Provinces*: Deaodhan—; *Ceram*: Fala—; *Chinese*: Ch'en Lien Mi, Hsien, Keng, Tao, Tao Tzeu—; *Cochin China*: Lua—; *Danish*: Riis—; *Deccan*: Chanval—; *Dutch*: Rijst—; *East Indies*: Paddy—; *Egypt*: Arus, Rus, Ruz—; *English*: Rice—; *Ewe*: Molung, Morli, Morlu—; *Fanti*: Omo—; *Fatehpur*: Phasai—; *French*: Riz—; *Ga*: Omong—;

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Gambia: Mannow—; *German*: Reiss—; *Greek*: Oryza, Oryzion, Oryzon—; *Guam*: Fae, Fai, Faria—; *Gujerati*: Chokha—; *Hausa*: Shinkafa—; *Hazara*: Shali—; *Hindi*: Chaval, Deodhan, Dhan, Pusui—; *Hungarian*: Riskasa—; *Indo-China*: Khao, Nganh, Nhu—; *Iraq*: Shilib, Ruzz—; *Italian*: Riso—; *Japanese*: Ko, Kome, Motsj—; *Java*: Bai—; *Jhang*: Munji—; *Kashmir*: Dein, Tani—; *Khmer*: Srau, Srou, Srur—; *Kolami*: Baba, Birbaba—; *Konkani*: Bhat—; *Krepi*: Morli—; *Krobo*: Omong—; *Kurdish*: Chaltuk, Pishik—; *Laos*: Khao chao, Khao hai, Khao loi, Khao nieu—; *Madagascar*: Vary—; *Malay*: Pady—; *Malayalam*: Ari, Nellu—; *Marathi*: Bhat, Tandula—; *Matabello*: Feha—; *Mon*: Sro—; *Mount Abu*: Garri, Sal—; *Mundari*: Baba—; *Mysol*: Fas—; *Mysore*: Bhatta, Nellu—; *North-West Provinces*: Chanwal, Dhan, Jarhan, Lehi, Munji, Pusai—; *North Queensland*: Kineyah—; *Oudh*: Dhan, Pashai, Passari, Tinni—; *Palaung*: Rekao, Sakao, Takao—; *Pandran*: Kandahari, Khisumbhuz, Wilaiti—; *Partabgarh*: Sathi—; *Persian*: Biranj—; *Peshawar*: Shol—; *Philippines*: Bolahan, Palai—; *Polish*: Ryz—; *Portuguese*: Arroz—; *Punjab*: Dhan, Munji, Shalian, Tai—; *Rajputana*: Garri—; *Rampur*: Phasai—; *Roumanian*: Orez—; *Russian*: Psheno, Ris, Sarachinskoe psheno—; *Sanskrit*: Arunya, Ashuvrihi, Dhanya, Nivara, Shali, Tandula, Vrihi—; *Santal*: Uri, Urihoro—; *Sema*: Aghi—; *Shahrig*: Shali—; *Sind*: Chanwar, Sari, Sugdasi—; *Sinhalese*: Goyan, Hal, Uruwi—; *Spanish*: Arroz—; *Sunda*: Pare, Pari;— *Swedish*: Ris—; *Tagalog*: Bigas, Binambang, Bolohan, Dumali, Lamuyo, Malagguit, Palay, Quinanda, Tangi—; *Tamil*: Arishi, Arisi, Nellu—; *Tartary*: Dugu—; *Tayabas*: Nilomot—; *Telugu*: Biyam, Dhanyamu, Errajilama, Nevaridhanyamu, Ouri, Urlu, Vadlu, Vudlu—; *Tobu*: Shali—; *Turkish*: Pirinj, Pirins—; *Twi*: Aimong, Mong—; *Uriya*: Balunga, Chaul, Dhan, Dhanno, Rabana—; *Xong*: Ruko—; *Zehri*: Pirkalanari—.

Oxytenanthera.

This genus includes 16 species occurring in India, Burma, Malaya and Africa.

Oxytenanthera sinuata Gamble is found south of the Malay Peninsula in Johor, and Negri Sembilan; but nowhere very common.

The very fine hairs found on the sheath leaves of the young sprouts are prominent among Malay poisons. They are frequently used with pounded glass and set up a train of symptoms like that of a chronic pseudo-dysentery.

In Kelantan bamboo hairs are sometimes mixed with the juice obtained from *Caryota mitis* Lour. and an extract of toad. This toad extract is made from the common brown toad by allowing it to decompose in a bamboo cylinder containing a little water; after an interval of seven days this is smeared or sprinkled over wearing apparel, and the ingredients are said to set up an incurable and painful skin disease like a ringworm in appearance.

The hairs are mixed with the ground bark of *Wickstroemia ridleyi* Gamble and decayed copra, and then thrown into rivers to stupefy fishes.

Malay: Buloh minyak—.

Panicum.

This genus is a heterogeneous assemblage of about 400 species, mostly natives of warm regions, a few being found in temperate climates of the northern hemisphere, one or two being almost cosmopolitan.

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Many species are much valued as fodder-grasses but a few are said to be toxic to the animals.

I. Annuals.

a. Spikelets $\frac{1}{6}$-$\frac{1}{5}$ in. long. Stems tufted, 2-4 ft. long, stout. Leaves 6-12 in. long — 1. *P. miliaceum.*

b. Spikelets $\frac{1}{10}$-$\frac{1}{8}$ in. long. Stem 1-3 ft. long, rather slender. Leaves 1-2 ft. long ... — 2. *P. miliare.*

II. Perennials.

a. Spikelets $\frac{1}{10}$ in. long, laxly clustered on the branches; glume IV smooth. Leaves 6 by $\frac{1}{6}$ in. Panicle 6 in. high ... ... — 3. *P. antidotale.*

b. Spikelets $\frac{1}{12}$-$1\frac{1}{8}$ in. long, large, scattered; glume IV finely rugulose. Leaves 1-2 ft. by $\frac{1}{2}$-1 in. Panicle 1-2 ft. high ... — 4. *P. maximum.*

c. Spikelets small, very numerous, crowded: glume IV smooth. Leaves 5-12 in. by $\frac{1}{4}$-$\frac{1}{2}$ in. Panicle 7-12 in. long ... ... — 5. *P. sarmentosum.*

1. **Panicum miliaceum** Linn. is cultivated or naturalized throughout the hotter parts of India, Africa and other hot countries. It is grown in various parts of India, even up to 10,000 ft. on the Himalaya, but nowhere to any great extent.

Ayurveda writers describe the plant as sweet and acrid, causing biliousness and indigestion.

At Shoran, in Baluchistan, the plant is used as a cure for gonorrhoea.

Arabic: Dokhu, Worga, Worglo—; *Ashkobi*: Azhaum, China—; *Bagwana*: Peonprish—; *Bengal*: China—; *Bihar*: China, Chinh, Chinna—; *Bombay*: Bansi, Chenah, China, Chirwa, Phikar, Rali, Sama, Sawa, Vari, Varikaanu, Varisava, Wadi, Worga—; *Bundelkhand*: Bansi, Phikai, Rali—; *Canarese*: Baragu, Bilibaragu, Karibaragu, Save—; *Chinese*: Chi, Shu—; *Deccan*: Sava, Sawi, Shamakh, Wari—; *Dutch*: Gierst—; *Egypt*: Dokhn—; *English*: Broom Corn Millet, Chena Millet, Common Millet, Indian Millet—; *French*: Mil, Mil en branches, Mil commun, Mil d'Inde, Petit mil, Millet, Millet commun, Millet à grappes, Millet rond, Millet rouge—; *German*: Hirse—; *Gujerati*: Chino, Samli, Vari—; *Hindi*: Chena, China—; *Iraq*: Dukhn—; *Kashmir*: Chinwa—; *Kila Saifulla*: Azhdan—; *Ladak*: Tzede—; *Lepcha*: Mung-cher—; *Marathi*: Barag, Sava, Vari—; *North-Western Provinces*: Chehna, Chinwa, Chirwa, Kuri, Sawanchaitwa, Sawanjethwa—; *Persian*: Arzan—; *Portuguese*: Milho miudo—; *Punjab*: Anne, Chena, China, Chini, Salan, Salar—; *Quetta*: Gamh—; *Roumanian*: Malaiu, Meiu—; *Russian*: Proso—; *Sanskrit*: Anu, China, Chirci, Rad, Varaka, Vrihibheda—; *Shoran*: Chabor—; *Sind*: Chinu—; *Sinhalese*: Mainairi—; *South Africa*: Indian Buffalo Grass—; *Tamil*: Kadaikanni, Katakanai, Samai, Varagu—; *Telugu*: Barigalu, Varagalu, Warigalu, Worga, Wuragi—; *Tobu*: Azhdun—; *Uriya*: Rala—; *Yemen*: Kossayb, Mileb—.

2. **Panicum miliare** Lam. is cultivated or naturalized throughout India and Ceylon. It is cultivated in the tropics.

According to some Ayurveda practitioners the plant acts as a nervine stimulant and tonic.

Bengal: Gondula—; *Bombay*: Badi, Bagad, Burburi, Kulti, Poi, Warai—; *Canarese*: Bilisamai hullu, Shamai—; *Central Provinces*: Chika—; *English*: Little Millet—; *Hasada*: Bicagurulu—; *Hindi*: Kungu, Kutki, Savan—; *Indo-China*: Co gang, Co ong—; *Khond*: Gundli, Pani kuhuri—; *Malayalam*: Shama—; *Mundari*: Arabende, Saramecadlongurulu—; *Naguri*: Hendegudulu—; *North-Western Provinces*: Kutki, Mighri—; *Punjab*: Kutki—; *Rajputana*: Nillashama—; *Ranchi*: Mota gundli—; *Santali*: Gundli—; *Sinhalese*: Meneri—;

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Tamil: Chamai, Perusamai, Samai, Shamai—; *Telugu*: Chamalu, Gangasamalu, Nallachamalu, Nellashama, Nellashamalu, Sani, Savai—; *Uriya*: Luniva—.

3. **Panicum antidotale** Retz. grows abundantly in the Punjab, the Upper Gangetic Plain, the Western Peninsula and Ceylon. It extends to Afghanistan, Africa and Australia.

The smoke of the burning plant is used for fumigating wounds, also as a disinfectant in small-pox.

In Madras it is given for throat affections.

A report from Hissar states that this grass is grazed only when green, as it afterwards becomes bitter or saltish, and poisonous to cattle.

Baluchi: Bershonk, Gomaz, Gumazg—; *Bombay*: Barigagli, Barn, Barwari, Ghamar, Gharam, Girni, Git, Male, Mangrur, Sera, Shamukha—; *Gujerat*: Dun, Dusghas, Dusto—; *Hindi*: Ghemor, Gunara, Jamur—; *Kulanch*: Gomaz—; *Mand*: Dariagi—; *North-Western Provinces*: Gamur, Ghamor—; *Punjab*: Baru, Garm, Ghamrur, Ghamur, Gharam, Ghirri, Girui, Mangrur—; *Pushtu*: Male, Shamukha—; *Rajputana*: Bangagli, Banvari, Gramna—; *Sadani*: Bende—; *Santali*: Layogundli—; *Shahrig*: Gunj—; *Sibi*: Gam—; *Sinhalese*: Krimisastru—; *Tamil*: Nassiampillu, Pinisupillu—.

4. **Panicum maximum** Jacq. is a native of Africa, cultivated in many parts of India. It occurs throughout South Africa, the Mascarene Islands, Madagascar and in Yemen. It has been introduced and is widely spread in America.

This grass is considered one of the best horse-fodders, but it may cause fatal colic if given in too large a quantity or when wet.

It is said to be responsible in South Africa for the production of 'dikoor', a disease which affects young sheep, four to twelve months old, which are running on old lands.

Ala: Ikbo mili—; *Brazil*: Capim de Angola, Capim de Colonia—; *Burmese*: Nau-Ka-thau-hau—; *Canarese*: Gini hullu—; *English*: Guinea Grass—; *Ewe*: Kogbe—; *Fanti*: Nykekyer—; *Ga*: Nto—; *Hindi*: Gini ghaus—; *Orange Free State*: Blousaad—; *Seychelles*: Fataque—; *Sinhalese*: Ratatana—; *Southern Nigeria*: Ikbo mili—; *Tamil*: Giniopillu—; *Transvaal*: Buffelgras—.

5. **Panicum sarmentosum** Roxb. is found in Assam, Sylhet, Cachar, and the Khasia Hills, ascending to 5,000 ft., Chittagong, and Burma. It is very abundant in the Malay Peninsula in thickets and open edges of woods, often forming great masses scrambling over bushes and ascending to tree-tops. It extends to the Malay islands, Tongking, and China.

In Malaya the roots are chewed with betel nuts as an aphrodisiac.

Malay: Rumput jangut ali, Rumput kulubong—.

Paspalum.

This is a plymorphic genus including over 200 species, scattered through the tropics of both hemispheres, but most abundant in America.

I. Spikelets oblong or lanceolate acute or acuminate. Margin of rachis minutely toothed ... 1. *P. sanguinale.*

II. Spikelets orbicular or broadly oblong.
  a. Spikelets ciliate from the margins of the upper glume ... ... 2. *P. conjugatum.*
  b. Spikelets not ciliate ... ... 3. *P. scrobiculatum.*

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1. **Paspalum sanguinale** Lam. is found throughout India, in moist and dry situations, ascending the Himalaya to 6,000 feet. It is cultivated in the Khasia Hills. This grass is one of the commonest weeds in all tropical and warm countries, becoming less frequent in Central Europe.

The plant is known to yield hydrocyanic acid.

Berar: Chikhar—; *Central Provinces*: Korkoljodi—; *Egypt*: 'Iraq-en-Najil, Tayyin—; *Hindi*: Takri, Takria—; *Khasi*: U'rai-shan—; *North-Western Provinces*: Charaimara, Kewai—; *Punjab*: Baratakria, Dubra, Farw, Motikhabbal, Takkri—; *Rajputana*: Hen—; *Suto*: Mmoyane—; *Trans-Indus*: Khurash—; *United States*: Brab Grass—.

2. **Paspalum conjugatum** Berg. is common in the hotter parts of America from the Gulf States southwards; also in the Indo-Malayan region, Lower and Upper Guinea, and Polynesia.

In some places of the Gold Coast the grass is boiled and used in the bath to cure faintness.

Ashanti: Nsuorhwea—; *Hawaii*: Hilo Grass—; *Jamaica*: Sour Grass—; *Malay*: Rumput kerbau—; *Malaya*: Buffalo Grass—; *Montserrat*: Crab Grass—; *Sierra Leone*: Yane, Yani—; *Singapore*: Green Grass—; *Twi*: Nsorhwea—; *West Indies*: Sour Grass—.

3. **Paspalum scrobiculatum** Linn. is found wild or cultivated throughout the hotter parts of India, from the Punjab eastwards and southwards to Singapore and Ceylon. It is distributed through the Tropics of the Old World.

Ayurveda writers describe the plant as sweetish and bitter, tonic, and antidotal to poisons, useful in the treatment of ulcers; it causes constipation and flatulence, upsets the physiological balance of the body, and leads to hallucinations and dysuria.

Mohammedan authors consider it styptic, useful in inflammation and in diseases of the liver, liable to cause constipation and temperature.

Though used as food by a very large number of people in India, the grain is decidedly a narcotic poison, and its deleterious effects are well known in the various parts of the country where this crop is grown. The symptoms of poisoning resemble those caused by datura, and are more severe in cattle than in man, due no doubt to the animals eating the grain and husk, and also to the absence of vomiting, an effect which almost always takes place in man.

Sushruta prescribes the plant in combination with other drugs for the treatment of scorpion sting, but Caius and Mhaskar have shown experimentally that this grass is not an antidote to scorpion venom.

Australia: Ditch Millet, Hureek—; *Bengal*: Khodoadhan, Kodoadhan—; *Bihar*: Koda, Kodai—; *Bombay*: Harik, Kodra, Kodri, Kodro, Kodroakora, Pakod, Pakodi—; *Canarese*: Arikel, Haraka hullu, Harik—; *Central Provinces*: Kodie, Kodo—; *Ceylon*: Koda Millet—; *Gujerati*: Kodra, Kodro, Meya—; *Hausa*: Tumbijaki, Tumbin jaki—; *Hindi*: Koda, Kodaka, Kodava, Kodon—; *Kolami*: Garakode—; *Konkani*: Pacodd, Pacoll—; *Kumaon*: Kodo, Kodra, Kodram—; *Marathi*: Harik, Kodra, Kodru—; *Mundari*: Birjane, Loeongjane, Pirijane, Tasadjane—; *North-West Provinces*: Koda, Kodon, Kodram—; *Porebunder*: Kodo—; *Punjab*: Kodon, Kodra—; *Sanskrit*: Koddara, Kodrava, Koradusha, Kordrava, Kuddala, Madanagraka, Uddala, Vanakodrava—; *Santali*: Janhe—; *Sinhalese*: Amu, Karalamu, Walamu—; *Southern Nigeria*:

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Ikbonta—; *Tagalog*: Paragis, Sabungsabungan—; *Tamil*: Karuvaragu, Varagu, Varaku—; *Telugu*: Allu, Alu, Arikalu, Arike, Arikelu, Aruga, Kiraruga, Nita arigaddi, Pataarige—; *Urdu*: Kodon—; *Uriya*: Khoddi, Kodus—; *Zulu*: isAmuyisane—.

Pennisetum.

This genus numbers about 40 species which are found in most warm countries, particularly in dry regions.

Annual	...	...	...	...	1. *P. spicatum.*
Perennial	...	...	...	...	2. *P. compressum.*

1. **Pennisetum spicatum** Roem. & Schult. (=*P. typhoideum* Rich.) is cultivated in numerous forms in India, northern and tropical Africa, and southern Europe.

Ayurvedists consider the plant heating, aphrodisiac in women, and tonic; it is useful in diseases of the heart; it improves the appetite for food and the relish of it, but it causes flatulence.

In Guinea the root is reputed toxic to man and animals.

In South Africa the Sutos use the plant as a medicine for cows which have been incompletely delivered at parturition.

Arabic: Dookhr, Duku—; *Ashanti*: Ewio—; *Bihar*: Gahuma, Jondhariya—; *Bombay*: Bajera, Bajra, Bajri—; *Canarese*: Sajje—; *Egypt*: Dok, Hema, Gusab—; *English*: Bulrush Millet, Cumboo Millet, Pearl Millet, Spiked Millet—; *Eritrea*: Bultue—; *Ewe*: Gbekul, Lu—; *Ga*: Ngma—; *Gambia*: Sannio—; *Hausa*: Damro, Dauro, Gero, Maiwa—; *Hindi*: Bajera, Bajra, Bajri, Kasajonar, Lahra—; *Kolami*: Tuti—; *Krobo*: Ngma—; *Kumaon*: Bajra—; *Malayalam*: Kampam, Mattari—; *Mandingo*: Sannio—; *Matabele*: Um-velli-velli—; *Msutu*: Leeuja—; *North-Western Provinces*: Bajra, Bajra tangunanwa, Bajri, Lahra—; *Nupe*: Gero—; *Punjab*: Bajra, Bajza—; *Rajputana*: Bajra—; *Sanskrit*: Agradhanya, Nali, Nalika, Nilakana, Nilasasya, Sajaka, Varjari, Varjarika—; *Santali*: Lendha—; *Sesuto*: Nyalothie—; *Shahrig*: Bajari—; *Sind*: Bajaro—; *Sudan*: Dukhu—; *Tamil*: Kambu—; *Telugu*: Gantelu, Peddaganti, Sajja, Sajjalu, Sazza—; *Transvaal*: Leeuja—; *Tripoli*: Shessab—; *Uriya*: Bajramula, Gantiva—; *Zambesi*: Mishuera—; *Zanzibar*: Mawali—; *Zulu*: Amabile, Nyaloti, Nyawoti—.

2. **Pennisetum compressum** R. Br. (=*P. japonicum* Trin.) is found in Burma, Taong Dong, the Sham Hills up to 4,000 ft. It extends to China, Japan, Tongking and Australia.

This grass is used as a tonic in China.

Chinese: Lang Wei Ts'ao.

Phalaris.

This genus consists of 10 species, natives of the Mediterranean region, but widely dispersed as weeds; one species occurs in the boreal region and in South Africa, and another is found from California to Chile.

Phalaris arundinacea Linn. is found in Kashmir by the Wolar Lake at an altitude of 5,550 ft. It is fairly common along the pond edges and stream banks, and in wet places in Eastern Washington, but is infrequent in California. It extends to the northern temperate and Arctic regions.

This grass is reported poisonous.

English: Gardeners' Garters—; *Pacific Coast*: Daggers, Reed Canary-grass, Ribbon-grass—.

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PHRAGMITES.

This genus includes 2 species, one cosmopolitan, and one in Argentine.

Phragmites maxima Blatter & McCann (=*P. communis* Trin. =*P. roxburghii* Steud. =*P. karka* Trin.) is cosmopolitan.

Ayurvedists describe the plant as sweet and acrid, cooling, aphrodisiac; useful in biliousness, urinary troubles, vaginal and uterine complaints, erysipelas, and diseases of the heart.

The root is regarded as cooling and diuretic by the Chinese. It is considered diuretic and sudorific in Spain.

The plant is said to be rich in sugar. A manna, known as California Manna or Father Picolo's Manna, is mentioned as being deposited on the plants growing in California and collected by the Indians. It is believed that the manna is a saccharine deposit caused by aphides.

Arabic: Bus—; *Bengal*: Nal—; *Bihar*: Narkat—; *Burma*: Kaing—; *Canarese*: Hulugalagu, Hulugilahullu, Hulugilu—; *Catalan*: Canya borda, Canya de escombretas, Canyis, Canyisos—; *Chinese*: Lu—; *Egypt*: Buz haggny, Buz hagney, Ghab, Ghabrihy, Haggn—; *English*: Nodding Reed—; *French*: Cannette, Petit roseau, Roseau à balai, Roseau aquatique, Roseau des marais—; *Garhwal*: Bichhra—; *Gujerati*: Nairi, Nali—; *Hausa*: Machara, Wachiar giwa, Wutsiyar giwa—; *Hindi*: Nainarakula, Nal, Narkul, Nulanara—; *Hova*: Barorata, Katsaoka, Volotara—; *Indo-China*: Kiem, Lo can, Sai, Say—; *Iraq*: Qasab—; *Irish*: Giolcach—; *Italian*: Canela de Ema, Canna palustre, Cannuccia—; *Katagum*: Machara, Wachiar giwa, Wutsiyar giwa—; *Kolami*: Jankai—; *Kumaon*: Karka, Khaila, Khailuwa, Nal—; *Lagos*: Ifu—; *Languedoc*: Rouza, Rouzo—; *Loralai*: Nal, Nar—; *Libya*: Buzzam—; *Malay*: Gudabong—; *Malayalam*: Nadam, Nalam, Nannana, Naval—; *Malta*: Common Reed, Spire Reed, Canna di palude, Canna da spazzole, Kasbiet irrih—; *Marathi*: Deonala, Nala—; *Mexico*: Carrizo—; *Pacific Coast*: Common Reed—; *Punjab*: Bagnarri, Dila, Nai, Nal, Nar, Nara, Naria—; *Pushtu*: Drumbi, Dwarena, Ghwarga—; *Roumanian*: Rogoz—; *Sanskrit*: Dhhamana, Nada, Nala, Potagala, Shunyamadhya—; *Shahrig*: Nal—; *Sokoto*: Gabara—; *Spanish*: Cañeta, Garrizo—; *Tagalog*: Tambo—; *Tamil*: Perunanal—; *Telugu*: Kikkasagaddi, Mettantisa, Nagasvaramu, Peddarellu, Puvvuguttigaddi—; *Turkish*: Gamish—; *Uniyoro*: Mataetae—; *Uriya*: Nolo—; *Zhob*: Nal—.

PHYLLOSTACHYS.

This genus consists of about 20 Eastern Asiatic species.

Phyllostachys bambusoides Sieb. & Zucc. is found in Upper Assam on the Mishmi Hills. It inhabits China and Japan.

The plant is much used medicinally in China, where the root is considered tonic and the sprouts parasiticidal. The silicious concretion or *tabashir*, is a demulcent, tonic, aphrodisiac and pectoral, commonly administered in cough, asthma, consumption and fever.

Chinese: Chu, Chu Huang, Chu Sun, Hsien Jen Chang, Kuei Ch'ih, Suan Sun—; *Indo-China*: Son truc, Truc—.

POLYTOCA.

This genus consists of 8 species spread over tropical Asia and Australia.

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Polytoca barbata Stapf. is found in the hot and damp parts of India, from the Punjab to Assam and Munnepore, and southwards to Ceylon, extending to Java.

According to Ayurveda the plant is bitter and sweet, tonic, laxative and aphrodisiac. It is reputed useful in strangury, burning sensations, phthisis, vesical calculi, biliousness, diseases of the blood and tendency to haemorrhage.

Balghat: Kadpi—; *Bengal*: Gurgur, Keshaghansa—; *Canarese*: Kajalu—; *Central Provinces*: Kadpi—; *Chanda*: Kirmagilaramgadi—; *Gond*: Karpia—; *Gujrati*: Kansado—; *Hindi*: Kansa—; *Konkan*: Kasada—; *Marathi*: Kasai, Varival—; *Sanskrit*: Amarapushpaka, Ashvabala, Chamarapusha, Darbhapatraka, Ikshugandha, Ikshura, Ishika, Kanda, Karmamula, Kasekshu, Kasha, Nadeya, Niraja, Potagala, Sharada, Shiri, Sukanda, Vanahasaka—; *Telugu*: Ghellagadi—; *Uriya*: Phultainr—.

Saccharum.

This genus includes 8 tropical and subtropical species.

I. Hairs on callus much exceeding the spikelet. Glumes I and II not dorsally villous.
  a. Culms not leafy above, under .7 in. diameter. Leaves under .8 in. width. Glumes I and II ciliate ... ... 1. *S. spontaneum.*
  b. Culms densely leafy above, over 1 in. diameter. Leaves over 1 in. width. Glumes I and II glabrous ... ... 2. *S. officinarum.*

II. Hairs on callus of sessile spikelet shorter or not much longer than the spikelet. Glumes I and II often dorsally villous. Nodes of culm not bearded. Sheaths not hirsute. Glumes I and II dorsally villous.
  a. Foliage not glaucous. Culms densely leafy above. Sessile spikelet shorter than internodes ... ... 3. *S. arundinaceum.*
  b. Foliage glaucous. Culms not leafy above. Sessile spikelet longer than internode of rachis ... ... 4. *S. munja.*

1. **Saccharum spontaneum** Linn. is found throughout the warmer parts of India and Ceylon, ascending to 6,000 ft. in the Himalaya. It is distributed from the south of Europe to the warm regions of the Old World, and extends to East Australia.

Ayurveda practitioners commonly use this grass as a substitute for *Polytoca barbata* Stapf. Sanskrit authors credit the two plants with the same medicinal properties.

Bombay: Bochri, Dharbi, Dhub, Kan—; *Bengal*: Kagara, Kans, Kas, Kash, Kashiya, Khagra, Khansi—; *Burma*: Thekkaygyee, Thetkiakyn—; *Canarese*: Darbhe, Hodakehullu, Mutullahullu—; *Central Provinces*: Kans, Khan, Padar—; *English*: Thatch Grass, Wild Sugar Cane—; *Gujerat*: Kans, Kansado, Kansadoghas—; *Hasada*: Karetasad, Karitasad—; *Hausa*: Abokin, Kyamo, Kyamo kibiya, Kyamro, Kyauro, Kyauro kibiya, Sheme, Sansari—; *Hindi*: Kagara, Kans, Kas, Khansi, Khugura, Kosa, Kus—; *Kolami*: Puyal—; *Kumaon*: Jasha, Jhaush, Kash—; *Lao*: Pong—; *Lepcha*: Brung—; *Malayalam*: Nannana—; *Marathi*: Kagara, Kas—; *Mundari*: Kariba—; *Naguri*: Kasitasad—; *North-Western Provinces*: Kans, Kansa, Kansi—; *Oudh*: Khagar, Rara—; *Punjab*: Kahi, Kanh, Kans, Sarkara—; *Rajputana*: Kans, Kash, Kashi—; *Sadani*: Kasighas—; *Sanskrit*: Ikshugandha, Kasa, Kahsa, Khaggara—; *Sind*: Kahu, Khan, Khau—; *Tamil*: Achabaram, Anjani, Eruvai, Kosangam, Kucham, Kumil, Kurbagam, Nanal, Nanarbul, Nanmugappul, Peykkarumbu,

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Sangabidam, Saravanam, Sarupparasi, Sasabaram, Sugattan, Suvedasaram, Tittiru, Tittiruchi, Tuttam, Vedasam—; *Telugu*: Billugaddi, Kakicheraku, Kakiveduru, Koregadi, Rasalamu, Rellugaddi, Vetticharaku—; *Uriya*: Chhataiagaso, Inkoro, Kaso, Khhodi, Pothhorokhhodi—.

2. **Saccharum officinarum** Linn., probably a native of South Asia, is grown everywhere in India.

Ayurveda describes the sugar cane as sweet, oleagenous, diuretic, tonic, cooling and aphrodisiac. It recommends it as a useful remedy in fatigue, thirst, intestinal troubles, anaemia, erysipelas and leprosy. The cane, however, is indigestible, and likely to interfere with the heat factor in the body causing inflammations and ulcers.

Yunani describes the cane as sweet, laxative, diuretic, fattening and aphrodisiac. It considers it useful to purify the blood, good for the lungs, but bad for the liver.

The roots are used as a cooling and diuretic medicine; and the stem is said to be useful as a remedy for cough.

Sugar cane enters into the composition of Cambodian medicines used for the treatment of ulcers of the skin and mucous membranes. A decoction of the stem is given in diarrhoeas of childhood.

The sugar cane is recognised in Portugal, Spain, Switzerland and the United States as the officinal source of sucrose or saccharose.

The Hindus set a great value upon sugar, and in medicine it is considered by them as nutritious, pectoral and anthelmintic.

In Arabian works on Materia Medica, sugar is described as detergent and emollient. Many writers speak of it as attenuant and pectoral. It has also been supposed to have virtues in calculus complaints.

In the Punjab sugar is considered heavy, tonic and aperient, useful in heat delirium and disorders of the bile and wind.

In cases of poisoning by copper, arsenic, or corrosive sublimate, sugar has been successfully employed as an antidote; and white sugar finely pulverised is occasionally sprinkled upon ulcers with unhealthy granulation.

The root, the bark, the stem and the leaf, treacle and sugar, have all been boomed as snake-bite remedies. Mhaskar and Caius have, however, shown experimentally that, whether administered internally or applied externally, every part of the sugar cane is useless in the treatment of snake-bite.

Ada: Afunu—; *Annam*: Mia—; *Arabic*: Kasabishakar, Kasibshakar, Qasabussakar—; *Awina*: Fofongu—; *Behar*: Katari, Ketari, Khusiyar, Ukh, Ukh, Ukhi—; *Bengal*: Ak, Ganna, Ik, Kajuli, Kulluar, Kushiar, Puri, Uk, Ukyo—; *Bombay*: Ganderi, Gol, Serdi, Us—; *Brazil*: Canna, Canna de assucar, Tacomaree, Viba—; *Burma*: Keyan, Kyan—; *Cagayan*: Agbo—; *Cambodia*: Ampeou, Ampou—; *Canarese*: Ikshu, Ikshudanda, Ingolu, Kabbu, Kantara, Kantaraka, Madhura, Marakabbu, Pundra, Rasadali, Rasala, Rastale, Tanigarbu, Trinaraja—; *Catalan*: Cana dolsa, Cana de sucra—; *Ceylon*: Karambu—; *Chinese*: Kan Che, Sha T'ang, Shih Mi—; *Cochin China*: Mia—; *Deccan*: Ganda, Us—; *Dutch*: Suiker riet—; *Easter Island*: To—; *Egypt*: Ghah, Qassab sukkar—; *English*: Sugar Cane—; *Ewe*: Fofongu, Bogleng—; *Fanti*: Ahwerenkakraba—; *Fiji*: Dovu, Vico—; *French*: Canamelle, Cannamelle, Canne de Batavia, Canne de la Chine, Canne d'Haïti, Canne à sucre, Roseau

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ă sucre—; *French Guiana*: Canne à sucre—; *Ga*: Sheng—; *German*: Zuckerrohr—; *Guam*: Tupo, Tupu—; *Gujerati*: Naisakar, Serdi, Sheradi, Sherdi, Uns—; *Gulf States*: Ribbon Cane, Sugar Cane—; *Hausa*: Deke, Karansariki, Rake—; *Hindi*: Ganna, Ikh, Kajuli, Khulua, Kumad, Naishakar, Rikhu, Uk, Ukh—; *Hova*: Fary—; *Iraq*: Qasab sukkari—; *Japanese*: Kansia—; *Java*: Tebu—; *Kano*: Rake—; *Konkani*: Uny, Uss—; *Krepi*: Bogleng, Boglengbiei, Boglengfe, Boglengyibor—; *Korbo*: Ahleu—; *Kumaon*: Rikhu—; *Kurdish*: Gamish-i-shikir—; *La Reunion*: Canne—; *Madagascar*: Fary—; *Malay*: Tebu, Tibu mira, Tubu—; *Malayalam*: Darbheshu, Ikshu, Kantarakam, Karimpu, Madhutrinam, Vellakarimpu—; *Marathi*: Aos, Kabbo, Us, Usa—; *Mundari*: Gurdanda, Gurkatauri, Gurkosear—; *Nepal*: Akali, Chaku, Uk—; *Newar*: Tu—; *New Caledonia*: Ariva, Arolam, Boiepe, Boinlioua, Delenole, Dilou, Dogangueni, Gadenadeboui, Goreate, Jate, Kabopolenouen, Kiaboue, Kinemaite, Kondimoua, Koubala, Maiou, Mebouangue, Mengou, Migao, Moene, Moindiene, Moueouete, Ngala, Niemba, Ouali, Ouane, Oudiepe-ait, Ouen, Ouen ebail, Ouen mangia, Ouen ou poudendate, Paiambou, Paieme, Pidiak, Pobone, Poilote, Schimate, Sthiabanghi, Tangalite, Thsiogan, Tilibi, Tshiambo—; *North-West Provinces*: Ganna, Ikh, Ikhari, Kanthirikhu, Punarikhu, Rikhu, Ukh, Ukhari—; *Parbuttiah*: Ghenra—; *Persian*: Naishakar—; *Philippines*: Tubo—; *Portuguese*: Canna de assucar, Canna doce—; *Punjab*: Canna, Ikh, Kamad, Kamand, Khand, Paunda, Shakarsurkh—; *Roumanian*: Trestie de zahar—; *Russian*: Saharnyi trastnik—; *Sakalave*: Fisika—; *Samoa*: Tolo—; *Sanskrit*: Adhipatra, Asipatra, Bhurirassa, Dirghachhada, Gandidi, Gudada, Gudadaru, Gudakashtha, Gudamula, Gudatrina, Ikshu, Ikshura, Kantara, Kantaraka, Karkotaka, Khadgapatraka, Koshakara, Madhutrina, Madhuyashit, Maharasa, Mrityupushpa, Payodhara, Pundraka, Rasala, Rasalu, Sastra, Sukumasaka, Trinadhiya, Vansha, Vipularasa, Vrishya—; *Santali*: Akh, Ikhshu—; *Sind*: Kamand—; *Sinhalese*: Uk, Ukgas—; *Sokoto*: Arakke—; *Spanish*: Caña de azucar, Caña dulce, Cañamiel—; *Tagalog*: Tubo—; *Tahiti*: To—; *Tamil*: Angarigai, Asibattiragam, Ikku, Kalai, Kannal, Karumbu, Madudirunam, Paruvayoni, Pundaram, Ukkiragandam, Ukkiragandi, Velam, Vengarumbu—; *Telugu*: Arukanupulakranuga, Cheraku, Cherakubhedamu, Cherakubodi, Cherakudubu, Ikshupu, Inju, Kantaramu, Kanupulacheraku, Lavucheraku, Pottikamucheraku, Tellacheraku, Tiyyamranu, Tunta, Vamsukamu—; *Tongking*: Mia, Mia co ke, Mia lau, Mia ly—; *Tulu*: Karumbu—; *Twi*: Ahwereu—; *Urdu*: Cana—; *Uriya*: Aku, Gudodaru, Ikhyu—; *Visayan*: Quilaba—; *Yemen*: Muddardjend—.

3. **Saccharum arundinaceum** Retz. is found throughout the plains and low hills of India, extending into China.

The root is demulcent and diuretic.

Bengal: Teng—; *Burma*: Phoungga—; *Canarese*: Abbe, Baragu, Hodakai hullu, Lekhinihullu, Munja, Munji, Nala, Rellu, Sara—; *Ceylon*: Elephant Grass—; *English*: Devil Sugar Cane, Reedy Sugar Cane, Wild Sugar Cane—; *Malaya*: Elephant Grass, Tebrau—; *Malayalam*: Mekhalapullu, Munja, Sarappullu—; *Punjab*: Sarkanda—; *Rajputana*: Sarpat—; *Sanskrit*: Gundra, Munja, Sara, Tejanaka—; *Sinhalese*: Rambuk—; *Tamil*: Elhudugirananal, Munji, Pikarumbu—; *Telugu*: Adavicheruku, Bramhamekhalamu, Gundra, Kondakanamu, Munjagaddi, Mungamu, Nadamu, Polagaddi, Ponika, Ponugu, Saramu—; *Uriya*: Kantosoro, Soro—.

4. **Saccharum munja** Roxb. (=*S. ciliare* Anders.) is abundant over the greater part of North-West India, especially in the Punjab, extending to the Upper Gangetic Plain.

Ayurveda describes the stem as sweet and acrid, cooling, and aphrodisiac; useful in thirst, burning sensations, erysipelas, diseases of the blood, urinary complaints, and eye troubles.

In the Punjab the root is burnt near women after delivery, its smoke being considered beneficial. The root is also used as a fumigant for burns and scalds.

Ajmere: Sara, Sarpat—; *Bengal*: Mucha, Ramshara, Sar, Sara, Sarpata, Shar—; *Bolan River*: Kash—; *Bombay*: Kerpa, Munj, Sar—; *English*: Munj

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Grass—; *Hasada*: Mail—; *Hindi*: Munj, Munja, Ramsar, Sara, Sarkanda, Sarkara, Sarpat, Sarpatta—; *Marathi*: Mole—; *Mundari*: Hatumail—; *Naguri*: Mahil—; *North-West Provinces*: Ikar, Patawar, Sarhar, Sarkanda—; *Oudh*: Palwa—; *Pishin*: Surghashae—; *Punjab*: Kanda, Kharkana, Sarjbar, Sarkara—; *Quetta*: Surghashae—; *Sanskrit*: Bahupraja, Bana, Bhadramunja, Brahmanya, Chakshuveshtana, Darbhavhaya, Dridhatrina, Durmula, Ikshukanda, Maunji, Munja, Munjanaka, Munjata, Ranjana, Shakrabhanga, Shara, Shiri, Sthuladarbha, Sumekhala, Tejana, Tejanavhaya, Trinakhya, Vaniraka—; *Santali*: Sar—; *Telugu*: Gundra, Ponika—; *Tharu*: Kandikhar, Karai—; *Trans-Indus*: Darga, Karre—; *Turbat*: Dil—.

Setaria.

This genus numbers about 100 species, found in tropical and warm temperate regions.

S. italica Beauv. and *S. viridis* Beauv. are used medicinally in China; *S. plicata* T. Cooke in La Reunion; *S. sulcata* Raddi in Zululand.

I. Leaves more or less plicate. Perennial. Culm reaching 5 ft.	...	...	...	1. *S. plicata.*
II. Leaves flat, not plicate.				
a. Culm 2-5 ft. high	...	...	...	2. *S. italica.*
b. Stem 1-2 ft. high	...	...	...	3. *S. viridis.*

1. **Setaria plicata** T. Cooke is found throughout the moister hilly parts of India, from Kumaon in the Himalaya eastwards, ascending to 5,000 ft. in Sikkim, the Shan Hills in Burma, the Nilgiris up to 6,000 ft., the Malay Peninsula, and Ceylon. It extends to the Malay Islands and China.

The plant is used in La Reunion as an emollient diuretic.

La Reunion: Trainasse—; *Malay*: Akar pimpan—.

2. **Setaria italica** Beauv. is cultivated throughout India, and up to 6,000 ft. in the Himalaya. It is found in most warm, temperate and tropical countries.

According to Ayurvedic texts the plant is sweet and acrid, fattening, aphrodisiac, and sedative to the gravid uterus. It is useful in dispelling burning sensations, and in healing fractures. It produces flatulence.

It is a popular domestic remedy for alleviating rheumatic pains and the pains of parturition.

The grain is said to act as a diuretic and astringent, and to be of use externally in rheumatism.

When taken as the sole food Indian Millet is sometimes apt to produce diarrhoea. It has long been regarded as unsatisfactory for horses unless fed sparingly.

Andamans: Tanahal—; *Arabic*: Dukhn—; *Bengal*: Bertia, Chena, Kakni, Kakun, Kangni, Kangu, Kauni, Kirakang, Kirang, Kora, Rala, Rawla, Tangan—; *Bombay*: Kakun, Kang, Kangni, Korakang, Korakangu, Vavani—; *Bonai*: Kango—; *Bundelkhand*: Kakun—; *Burma*: Puki, Pyounglaykouk, Zami—; *Canarese*: Karibiragu, Naoni, Navanai, Navani, Vavani—; *Catalan*: Cúa de guilla, Cúa de guinea, Panis, Panissa—; *Cebu*: Mijo—; *Central Provinces*: Kungni, Rala—; *Chinese*: Liang, Shu, Su—; *Cochin China*: Cay khe—; *Deccan*: Bertia, Chena, Kakni, Kakun, Kangni, Kangu, Kauni, Kirakang, Kiranj, Kora, Rala, Rawla, Tangan—; *English*: Boer Manna, Foxtail Millet, Hungarian Grass, Italian Millet, Millet—; *French*: Mil à épi, Mil d'Italie, Millet en épi, Millet des oiseaux, Panis d'Italie, Panouil, Panouque, Penille—; *Gujerati*: Kang, Karang—; *Hindi*: Bertia, Chena, Kakni, Kakun,

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Kalakangni, Kanghuni, Kangni, Kangu, Kauni, Kirakang, Kiranj, Koni, Kora, Rala, Rawla, Tangan—; *Ilocano*: Bicacao, Bucacao—; *Iraq*: Dukhn—; *Italian*: Panico—; *Kashmir*: Pingi, Shali—; *Khasi*: U'rai-shoh—; *Kolami*: Haraba, Marang Kukru—; *Khondmals*: Arga—; *Konkani*: Kangu—; *Kumaon*: China, Gandra, Kangni, Koni, Mandira, Mandua, Murhoa, Shungura—; *Lynngam*: Jrai—; *Malay*: Iskoi—; *Malayalam*: Navana, Tauna, Tena—; *Malta*: Italian Millet, Panico—; *Marathi*: Chenna, Kang, Kangu, Rala, Rale—; *Mundari*: Irba—; *North-Western Provinces*: Kangni, Tangun—; *Pampangan*: Borona—; *Persian*: Arzun, Gal—; *Punjab*: Chanwalkangni, Chiurr, Gal, Huskетkangni, Kangni, Khauni, Kher, Kusht, Shak, Shali—; *Pushtu*: Gal—; *Sanskrit*: Chinaka, Kangu, Kanguni, Kangunika, Pitatandula, Priyangu—; *Santali*: Erba—; *Sema*: Asüh—; *Sind*: Kirang—; *Sinhalese*: Tanahal—; *Spanish*: Mijo menor, Panizo—; *Tagalog*: Daua, Dava—; *Tamil*: Tenai, Tennai—; *Telugu*: Kora, Koralu—; *Uriya*: Kangu, Tangun—; *Visayan*: Daoa, Daua, Dava—.

3. **Setaria viridis** Beauv. is found in temperate Himalaya and Western Tibet, ascending to 11,000 ft.; but it is in no way common anywhere. It is also rare on the plains of India. It has been reported from the Nilgiri Hills. It is distributed throughout the temperate and subtropical regions of the Old World.

The plant, crushed and mixed with water, is used in China as an external application for bruises.

Chinese: Kou Wei Ts'ao—.

Sorghum.

This genus consists of about 35 species spontaneous in the tropical and subtropical regions of both hemispheres, very few extending into the temperate zone. One group of forms is widely cultivated in the tropics, particularly in Africa and India.

A form of *S. guineense* Stapf. is grown for medicine in Upper Guinea; its grain is said to give colic to animals.

Perennial	...	...	...	1. *S. halepense.*
Annual	...	...	...	2. *S. vulgare.*

1. **Sorghum halepense** Pers. (=*Andropogon halepensis* Brot.) is common all over India, Burma and Ceylon in cultivated and uncultivated ground. It is distributed over most warm countries.

The seeds are demulcent and diuretic.

The grass is a good fodder both for grazing and for hay, but it is held to have injurious effects if eaten when too young or when the plants are stunted by drought. It has been reported from the Punjab that cattle after eating it had developed fatal head affections; and reports from various parts of Iraq indicate that the plant may cause the death of sheep or goats. This property is also well known in Australia, the United States of America and many other countries.

Banda: Bajra, Bara, Barru—; *Bengal*: Kalamucha—; *Berar*: Kartal—; *Bhabar*: Buru, Rikhon—; *Bombay*: Bara, Barru, Batal, Dacle, Kartal—; *California*: Arabian Millet, Evergreen, Means Grass, Millet—; *Canarese*: Kadukambu-hullu—; *Ceylon*: Johnson-weed, Sorghum-weed—; *Chanda*: Gallajari, Gudi, Paddajalla—; *Egypt*: Gerrau, Hashish-el-faras—; *English*: Aleppo Grass, Evergreen Millet—; *French*: Herbe de Para—; *Greek*: Kalamagra—; *Hindi*: Baru—; *Iraq*: Halaiyan, Sifrand—; *Kashmir*: Braham—; *Kohlu*: Baran—; *Kumaon*: Bikhonda—; *Malta*: Aleppo Millet-grass, Cannarecchia, Dente cavallino—; *Merwara*: Bowari—; *Punjab*: Baru, Barwa, Braham—; *Pushtu*:

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Barua—; *Sakalave*: Fembamboloky—; *Shahrig*: Baran—; *South Africa*: Cuba Grass, Johnson Grass—; *Tamil*: Kadu cholam—; *Telugu*: Gaddijanu—; *United States*: Cuba Grass, False Guinea Grass, Johnson's Grass, Mean's Grass, Mears Grass—; *Uruguay*: Gramillon, Pato ruso, Sorgo de Alepo—.

2. **Sorghum vulgare** Pers. (=*Andropogon Sorghum* Brot.) is widely cultivated in India. It is cultivated in numberless forms in the tropical and subtropical regions, particularly in the Old World, and in the warmer parts of the temperate zones of both hemispheres.

According to Ayurveda writers the grain is cooling, and aphrodisiac, improving both appetite and relish for food. It is useful in the treatment of general disorders, diseases of the blood, piles, ulcers, tumours. It is highly indigestible, and causes constipation.

The seeds are diuretic and demulcent.

American Negroes like the decoction of the seeds as a remedy for urinary, bladder and kidney, complaints.

The adventitious shoots growing out of derelict stumps are fatal to cows and goats. In Guranjwala, Gujerat, and Shahpur districts, it is said to be poisonous until the rains are over, when the cattle eat it with impunity.

Afghanistan: Jaor, Jaoriturkimani, Jawars, Jowar, Kiosagi—; *Arabic*: Dakkn, Dhura, Dhurat, Jawars, Taam, Zura—; *Ashanti*: Atokoor—; *Babian Shahrig*: Jowari, Targhar—; *Baghwana*: Dhutar, Turi—; *Bengal*: Jowar, Juar, Kasajonar, Kurbi—; *Betsileo*: Variampemby, Varifemba—; *Bhabar*: Junali—; *Bombay*: Burru, Jaundri, Joar, Jondla, Jowari, Kangra—; *Burma*: Pyoung—; *Canarese*: Jolah, Kenjol, Nirgol, Shalu, Yengara—; *Catalan*: Melca, Menca, Mill africá—; *Central Provinces*: Jowar, Phag, Thuthera—; *Ceylon*: Cholum, Durra, Great Millet, Guinea Corn—; *Chinese*: Kao Liang, Shu Shu—; *Deccan*: Jondla, Jowari—; *Egypt*: Dokhn, Dura, Dura-belledi, Durra, Kaydi—; *English*: Broom-corn, Guinea Corn, Great Millet, Indian Millet—; *Ewe*: Fo—; *French*: Balai, Balai de jonc, Balai d'eau, Blé de Guinée, Houque à balais, Maïs de Guinée, Mil d'Italie, Mil d'Inde, Millet d'Afrique, Millet à balais, Grand Millet noir, Millet de Turquie, Gros mil, Mil d'Ethiopie, Sorgho, Sorgho d'Afrique, Sorgho à balai, Sorgho commun—; *Ga*: Akoko—; *Gambia*: Bassiqui, Bassiwulima, Kous, Manio—; *German*: Moorhirse, Sorghum—; *Gold Coast*: Guinea Corn—; *Gujerati*: Jowar, Juar, Sundia—; *Hindi*: Janera, Joar, Jondla, Jowari, Juar, Jundri, Juvarijondhla, Kanggni—; *Hova*: Ampemby—; *Iraq*: Dhurah, Idhrah baidha—; *Khasi*: U Krai—; *Kolami*: Gangai—; *Konkani*: Juar—; *Krepi*: Fo—; *Krobo*: Koko—; *Kumaon*: Jowar, Junali—; *Kurdish*: Zurat spi—; *Languedoc*: Millangue, Millanque—; *Lao*: Ya pong—; *Las Bela*: Jowari—; *Lepcha*: Ra-Kong, Tsung-Kong—; *Makran*: Mohammadisa, Sohro—; *Malayalam*: Chavela—; *Mal Paharia*: Sissua—; *Malta*: Dariseed, Durrah, Karabocc, Melica, Saggiwa—; *Marathi*: Jondhala, Juari, Kadval, Shalu—; *Mundari*: Gangae, Ganggai—; *North-West Provinces*: Bajrahopanwa, Chotijuar, Juar, Junri—; *Oudh*: Bajrahopanwa, Chotijuar, Juar, Junri—; *Portuguese*: Milho—; *Punjab*: Bajrahupanwa, Chari, Chotijuar, Chotijunri, Joar, Junri, Ka—; *Russian*: Sorgo—; *Sakalave*: Bakaka, Morama—; *Sanskrit*: Dirghamala, Dirghashara, Ikshupatraka, Kshetrekshu, Raktakhumah, Shikhari, Vrittatandula, Yavanala—; *Santali*: Juar—; *Sarakhala*: Tarighara—; *Sema*: Atsünákhi—; *Sinhalese*: Karaliringu—; *South Africa*: Kaffir Corn, Kafir Corn—; *Spanish*: Alcandia, Saina—; *Tamil*: Cholum—; *Telugu*: Bondajanu, Jannu, Jonna, Jonnalu, Kondajanu, Tellajanu—; *Turkish*: Baiyadh dari—; *Twi*: Atoko, Awi, Kokorte—; *Uruguay*: Maiz de Guinea, Sorgo—; *Visayan*: Batad—; *Zulu*: Amabele, Imfe—.

Stenotaphrum.

This genus consists of 7 species, found mainly on the shores of the tropical and subtropical seas, four being confined to Madagascar and the neighbouring islands.

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Stenotaphrum glabrum Trin. occurs in the plains throughout India. It is found in Lower and Upper Guinea, also in South Africa from Cape Town to Natal, on the American shores of the Atlantic from South Carolina to the La Plata and in the Pacific from Southern Mexico to Australia. It has been introduced in Southern France and Italy.

The rhizome is diuretic, and the decoction is used in Brazil as a diuretic and sudorific.

America: St. Augustine Grass—; *Australia*: Buffalo Grass—; *Bahia*: Grama da Praya—; *Bermuda*: Crab Grass—; *Florida*: Mission Grass—; *Jamaica*: Pimento Grass—; *La Reunion*: Chiendent de boeuf—; *Mauritius*: Herbe bourrique—; *Natal*: Tweek Grass—; *St. Helena*: English Wire Grass, Mat Grass—; *Transvaal*: Tweek Grass—.

Stipa.

This is a genus of over 100 species, spread over the temperate and tropical regions of both hemispheres.

S. inebrians Hance, *S. sibirica* Lam., and *S. viridula* Trin. are actively poisonous; *S. vaseyi* Scribner is a very active narcotic.

I. Leaves smooth; ligule oblong. Callus short, conical. Anther-tips bearded ... ... 1. *S. sibirica.*

II. Leaves scaberulous: ligule lanceolate. Callus scabrid, top bearded. Anther-tips naked ... 2. *S. capillata.*

1. **Stipa sibirica** Lam. is found in the Western temperate Himalaya, from Kashmir to Kunawar up to 8,000-9,000 ft. altitude, and to the Black Mountains. It extends to Afghanistan, Siberia and Korea.

This grass is actively poisonous and is reported to have caused death in horses and other domestic animals.

2. **Stipa capillata** Trin. is found in Western Himalaya, ascending up to 11,000 ft. in Kashmir. It extends westwards to Spain, Dahuria, China.

This grass frequently kills sheep, not, however, by a direct poisonous action, but by its glumes working through the skin into the vital organs.

Thelepogon.

The one representative of this genus, **T. elegans** Roth., occurs in Central India, the Konkan and Malabar, extending to tropical Africa.

In Northern Nigeria it is fed to horses as a tonic. It is described as very bitter.

Hausa: Dataniya, Dwatana—; *Katagum*: Dandata—.

Themeda.

This genus numbers about 15-16 species, all natives of the tropical and subtropical regions of the Old World, mostly Indo-Malayan.

Themeda triandra Forsk. is found in the hotter drier parts of India, from Upper Bengal to Travancore, ascending the Himalaya to 3,000-4,000 ft. It also occurs in Burma and Ceylon, ascending to 4,000 ft. It is one of the commonest grasses of

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the drier regions of Africa, often forming extensive associations. It extends to Australia and all the warm regions of the Old World.

This plant is said to be used medicinally in China. It has been found to yield hydrocyanic acid.

Canarese: Bettanchi hullu, Gondamanchi hullu, Thodda anji hullu—; *Indo-China*: Quan—; *Natal*: Insinda—; *South Africa*: Rooi Grass—; *Tamil*: Erigai thattu pullu—.

Thysanolaena.

T. procera Mez. (=*T. agrostis* Nees=*T. acarifera* Nees and Arnot.), the only species of this genus, is found in subtropical Himalaya, from Kumaon eastwards and the Khasia Hills at altitudes of 4,000-5,000 ft., in Behar on the Parasnath, in the Deccan, Burma, Nicobar Islands, and the Malay Peninsula, where it abounds in dry banks in the hills at 1,000 ft. altitude and upwards from Penang to Malacca. It extends eastwards to New Guinea.

A decoction of the root is used in Chota Nagpur as a mouth-wash during fever.

Birja: Jopono—; *Gond*: Phulbari—; *Hasada*: Durhitasad, Duritasad—; *Indo-China*: Dong trung ha thao, Dot, Le, Ong anh, Xay—; *Khond*: Saderi, Saperi—; *Kolami*: Dodri, Gara-jonor—; *Malay*: Buluh tubaro—; *Mundari*: Garajapono, Garajono—; *Naguri*: Durhitasad—; *Santali*: Bushnia, Karsar—; *Saora*: Kondachipuru—; *Uriya*: Phulosoro—.

Triticum.

This genus consists of 20 species, natives of the Mediterranean region and of Western Asia.

T. aestivum Linn. is used medicinally in Europe, and three of its races—*T. amyleum* Ser., *T. durum* Desf., *T. spelta* Linn.—are used as tonics in Brazil.

Triticum aestivum Linn. (=*T. sativum* Lam.) is cultivated in many parts of Northern India and the Deccan Peninsula, especially in the North-West, and up to 13,000 ft. in the Himalaya and Tibet.

Ayurveda writers describe wheat as cooling, oleagenous, tonic, aphrodisiac, laxative, and fattening, improving appetite and relish for food. They held it as a useful medicine in general disorders of health; but they admitted that it was hard to digest.

'The fine floure', says Gerard, 'mixed with the yolke of an egge, honey and a little saffron, doth draw and heale byles and such like sores, in children and in old people, very well and quickly. . . . Slices of fine white bread laid to infuse or steepe in Rose water, and so applied unto sore eyes which have many hot humours falling into them, doe easily defend the humour, and cease the paine. The oyle of wheat pressed forth between two plates of hot iron, healeth the chaps and chinks of the hands, feet and fundament, which come of cold, making smooth the hands, face or any other part of the body.'

And Culpeper: 'The oil pressed from wheat by means of plates of iron or copper, heals tetters and ringworms, if used warm. The green corns chewed, and applied to the bites of mad dogs, heals them; wheat-bread poultices made with red wine, and

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applied to hot, inflamed, or blood-shot eyes, helps them. Hot bread poultices applied three days together, heals Kernels in the throat. Wheat flour mixed with juice of henbane stays the flux of humours to the joints, if laid thereto; or mixed with the yolk of an egg, honey or turpentine, draws, cleanses, and heals boils, plague sores, or foul ulcers. It is more useful for food than medicine; though a poultice made of it with milk, easeth pains, ripens tumours and imposthumations; and a piece of toasted bread dipped in wine, and applied to the stomach, is good to stay vomiting.'

Wheaten flour, bran, starch, and bread-crumb are still very much in demand as popular medicines in Europe and in all places inhabited by European settlers or their descendants.

The flour, which is officinal in France, is esteemed as an external application in erysipelas, burns, scalds, and various itching and burning eruptions. A mixture of flour and water is used as an antidote in cases of poisoning by salts of mercury, copper, zinc, silver and tin, and by iodine.

Bread is formed by making flour into a paste with water, with the addition of yeast, setting it aside to ferment, and then exposing it to the heat of an oven. A poultice is often made by boiling bread with milk; its effects are similar to those of a flaxseed poultice although it does not hold the heat so well. Bread-crumb is useful for giving bulk to pills, and for making poultices.

Bran is laxative, and may be used with advantage to prevent costiveness. Bran bread made from the unsifted flour, is an excellent laxative article of diet in some dyspeptic cases, and, owing to its freedom from starch, in diabetes. Bran poultices are useful for many purposes. Bran is sometimes used in the form of a decoction or infusion, as an emollient bath, and also internally as a demulcent.

Starch prepared from wheaten flour is officinal in all pharmacopoeias. It is employed for sprinkling over inflamed surfaces, to absorb acid secretions, and prevent excoriation. Mucilage of starch is valued in pharmacy for many purposes, and medicinally as a demulcent. In surgery it is occasionally employed for stiffening bandages.

Gluten is a term popularly known in connection with the names of 'gluten flour' and 'gluten bread', used and recommended especially in connection with the dietary of diabetics when starchy foods are to be administered in small amounts or altogether prohibited. These preparations are legion and in many instances are sold under claims which are as false and misleading as they are cruel in the hope of which they hold out to the sufferer from the disease.

In China the grains are roasted and are considered useful in colliquative sweating, especially in tuberculosis in women.

Afghanistan: Ganam, Gandam—; *Afrikaans*: Koring—; *Arabic*: Burr, Hintah—; *Ashkobi*: Spinghanam, Wasaghanam—; *Bagwana*: Dayak, Kandahari, Kub, Shorawaki, Shuthardandan, Sundia, Trimali—; *Bengal*: Gam, Giun, Gom—; *Bombay*: Gahu, Ghawn, Ghawutghum, Gium, Gohum, Kapale, Marghum—; *Brazil*: Trigo, Trigo candeal, Trigo tremez—; *Burma*: Giyousaba Gyungsaba—; *Canarese*: Godhi—; *Catalan*: Blat menut, Xeixa, Xexa—;

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Central Provinces: Ghubot, Seonikar—; *Chinese*: Ch'ao, Cheng Ping, Chiang, Hsiao Mai—; *Deccan*: Gohun—; *Dutch*: Tarwe—; *English*: Wheat—; *French*: Blé, Blé cultivé, Blé marcel, Blé marcet, Blé de mars, Blé d'été, Blé trémois, Froment, Froment cultivé—; *German*: Weizen—; *Greek*: Sitari—; *Gujerati*: Gawn, Ghavum, Govum—; *Hadramaut*: Burr—; *Harboi Hills*: Ghanam, Kholam, Shirukh—; *Hausa*: Alkama—; *Hindi*: Gehub, Gehun, Giun, Kunak—; *Hova*: Lafarina, Varimbazaha—; *Hungarian*: Buza—; *Italian*: Frumento, Grano—; *Jhalawan*: Geroli, Sundia—; *Kharan*: Pashmik—; *Khuzdar*: Geroli—; *Kila Saifulla*: Ghanam, Sarghanam, Spinghanam—; *Kirta*: Barkhani, Sungsillah—; *Konkani*: Gahum—; *Languedoc*: Blad, Bladet, Blat, Bled—; *Malayalam*: Gendum, Kotanpam—; *Malta*: Spring Wheat, Grano d'estate, Marzuolo, Civitella, Tomnija—; *Marathi*: Gahum, Gahung—; *Mastung*: Ghanam, Kholam—; *Michi*: Shruk, Tokar, Tomar, Tro—; *Nigeria*: Common Wheat, Egyptian Wheat, Miracle Wheat, Mummy Wheat, Wheat—; *North-Western Provinces*: Gehun—; *Oudh*: Gehun—; *Pab*: Khisankah—; *Persian*: Gandum—; *Portuguese*: Trigo—; *Punjab*: Do, Dro, Gehun, Kanak, Nis, Rozatt, To, Zud—; *Quetta*: Pashmik—; *Roumanian*: Grîu—; *Russian*: Pshenitza—; *Sadani*: Gehom, Gohom, Gom—; *Sanskrit*: Arupa, Bahudugdha, Godhuma, Kshiri, Mlenchhabhojana, Nistusha, Rasala, Saman, Sumana, Yava, Yavana—; *Saruna*: Khalam—; *Shahrig*: Boja, Gandun, Ghanam, Kholam—; *Sinhalese*: Tiringu—; *Sohrab*: Pesur, Puzho, Shuthardandan—; *Spanish*: Trigo candeal, Trigo chamorro, Trigo común, Trigo jejar, Trigo marzal—; *Tamil*: Godumai, Godumbaiyarisi—; *Telugu*: Godumulu—; *Wad*: Sundia—; *Zulu*: uKolo, uKolweni—.

a. **Triticum durum** Desf.—*Portuguese*: Trigo durasio—.

b. **Triticum spelta** Linn.—; *Arabic*: Hunta, Qamh, Qamh m'ghejir, Qamh ne ejghe, Qamh stejri—; *Catalan*: Escanya major, Espelta—; *Egypt*: Hunta Qamh—; *French*: Ampeutre, Engrain, Froment rouge, Grande épeautre, Ingrain—; *Spanish*: Escanda, Espelta—.

c. **Triticum amyleum** Ser.—*Brazil*: Trigo branco—.

Vetiveria.

This genus consists of 7 species, distributed throughout the tropics of the Old World; one has been introduced into the New World.

Vetiveria zizanoides Stapf. (=*Andropogon muricatus* Retz. =*A. squarrosus* Cooke) is found practically over the whole of India, and eastwards to Burma. It is very common in every part of the Coromandel Coast, and in Bengal and Burma, where it meets with a low, moist, rich soil, especially on the banks of the water-courses. It covers large tracts of waste land in Cuttack. It inhabits the plains of the Punjab and North-West Provinces, and ascends into Kumaon, 1,000-2,000 ft. in altitude. It is cultivated in Rajputana and Chota Nagpur. It occurs occasionally in Malay gardens, and extends to the West Indies, Brazil, and Lower Guinea. So far it has been found in the wild state only in tropical Asia.

Ayurvedists describe the root as bitter, cooling, stomachic, astringent and an antidote to poisons. They recommend its use in burning sensations, bilious fevers, sweats, foul breath, thirst, strangury, ulcers, and diseases of the blood.

Yunanists hold the root as cooling to the brain, bitter and soporific. They recommend its use in spermatorrhoea, headache, and diseases of the blood.

An infusion of the root is given as a febrifuge, and a powder in bilious complaints. It is regarded as stimulant, sudorific, stomachic, and refrigerant.

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The essence is used as a tonic.

A paste of the pulverised roots in water is also used as a cooling external application in fevers.

In Guinea the infusion of the roots is used as a tonic and an emmenagogue. In China it is chiefly used to remove dandruff.

The root and stem are Ayurveda cures for snake-bite and scorpion-sting, but Mhaskar and Caius have shown experimentally that neither is an antidote to either snake or scorpion venom.

Arabic: Izkhir, Usir—; *Bengal*: Bena, Khaskhas, Khor, Kuskus—; *Bombay*: Khasakhasa, Vala—; *Burma*: Miyamoe—; *Canarese*: Dhappa sajjai hullu, Kadu karai, Lavancha—; *Chinese*: Ko Cha—; *Cutch*: Vala—; *Deccan*: Khaskhas—; *English*: Cuscus, Khuskhus, Koosa—; *French*: Chiendent des Indes, Vétiver—; *Gujerati*: Valo—; *Hindi*: Bala, Balah, Bena, Ganrar, Kaskas, Khas, Onei, Panni, Usir—; *Indo-China*: Chuoc mat, Huong bai—; *Kolami*: Sirom—; *La Reunion*: Vétiver—; *Malay*: Akar wangi—; *Malayalam*: Ramachchamver, Vettiver—; *Marathi*: Vala—; *Mundari*: Birnijono, Sirum, Sirumjono—; *Oudh*: Tin—; *Persian*: Bikhiwala, Khas—; *Philippines*: Moro, Raiz do Moro—; *Punjab*: Panni—; *Sadani*: Birni—; *Sanskrit*: Abhaya, Amrinala, Avadaha, Dahaharana, Gandhadhya, Haripriya, Indragupta, Ishtakapatha, Jalamoda, Jalashaya, Jalavasa, Rambhu, Katayana, Laghubhaya, Lamajjaka, Nalada, Ranapriya, Samagandhika, Sevya, Shishira, Shitamulaka, Sugandhimula, Ushira, Vira, Virabhadra, Virana, Viratarn, Vitanamulaka—; *Santali*: Sirom—; *Sinhalese*: Saivandera, Savandramul—; *Tamil*: Ilamichamver, Vakil, Vettiver, Vilhalver, Viranam, Virkel, Viyal—; *Telugu*: Avurugaddiveru, Kassavu, Kuruveru, Lamajjakamuveru, Vettiveru, Vidavalliveru—; *Tharu*: Khatra—; *Urdu*: Khas—; *Uriya*: Bena—.

Zea.

The only species of this genus is of American origin, in cultivation in all warm countries of the world.

Zea mays Linn. is widely cultivated in India.

According to Hindu writers the grain is nutritive, demulcent, emollient, diluent, and absorbent; but, it is liable to produce flatulence.

It is considered by Mahomedan writers to be resolvent, astringent, and very nourishing; they consider it to be a suitable diet in consumption and a relaxed condition of the bowels. It is analgesic, and a decoction is recommended as a hip-bath for piles.

In the Konkan an alkaline solution is prepared from the burnt cobs and is given in lithiasis. In the Central Provinces the centre of the cob, deprived of the seeds and reduced to an ash by burning, is given in combination with common salt in bronchial catarrh and whooping cough.

In Europe and in the United States of America the grain is much used as a valuable article of diet for invalids and children. Corn bread contains more nourishment than wheaten bread, and is a better diet for persons suffering from diseases of the liver, or of the kidneys.

In Greece the silky stigmata are used in decoction in diseases of the bladder, a custom which also obtains in the Philippine Islands, where the plant is considered diuretic. The styles and stigmas have now been generally recognised as diuretic, anodyne, and demulcent. Under the popular name of 'corn silk', a liquid extract is sold as a remedy in irritable conditions of the bladder with turbid and irritating urine; it has a marked diuretic action,

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Zea, or the stigmas and styles, is employed in acute and chronic cystitis, and in the bladder irritation of uric acid and phosphatic gravel. It has also been employed in gonorrhoea, and has been affirmed to be a useful diuretic and even cardiac stimulant in the dropsy of heart disease.

The meal is made into emollient poultices. It is also made into mush by boiling, but its exclusive use gives rise to a skin disease.

In Cambodia the grains are prescribed in angina, and the stigmas in paludism.

Animals are sometimes poisoned from eating the green plant. Infants fed on Indian corn flour grow up rickety; it contains only about eighteen grains of proteic substance to the pound. The male flowers are said to contain hydrocyanic acid. The pollen is a possible cause of hay fever.

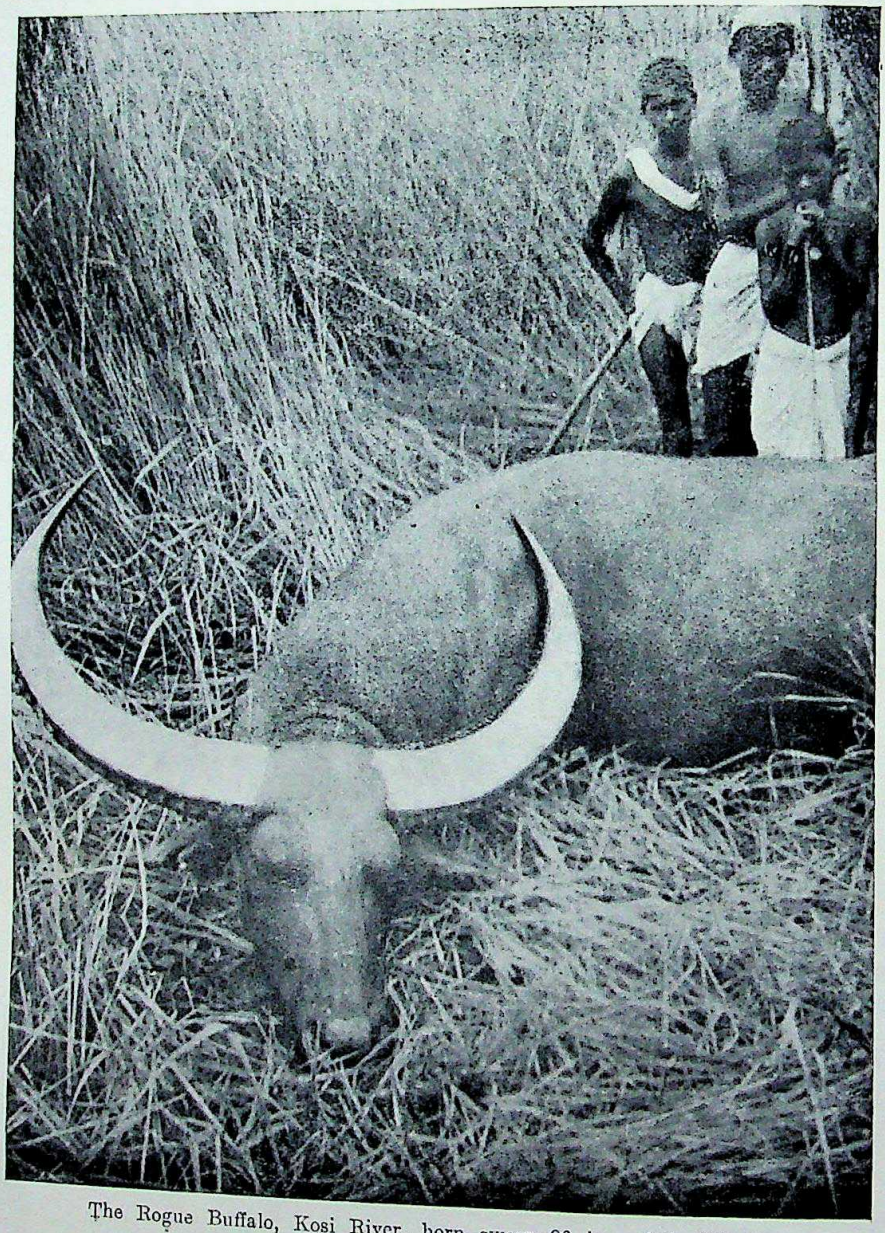
Accra: Abblay—; *Afghanistan*: Jaoari, Jaori, Jaorikhurdani—; *Afrikaans*: Mielie—; *Annam*: Bap ngo, Lua ngo—; *Arabic*: Durahkisan, Durahshani, Hintaherunu, Khalavan, Khandaruz, Zurratulmakkah—; *Ashanti*: Aburow—; *Awuna*: Akple—; *Bengal*: Bhutta, Janar, Kokka—; *Bombay*: Barjoar, Buta, Macka, Makai—; *Brazil*: Zaburro—; *Burma*: Pyaungbu—; *Cambodia*: Paut, Put—; *Canarese*: Goinjol, Makkai jola, Mekkejola, Musukujola—; *Catalan*: Blat de moro—; *Ceylon*: Cholum—; *Chinese*: Pang Tzeu, Yu Shu Shu—; *Chota Nagpur*: Jonar—; *Cochin China*: Bap ngo, Lua ngo—; *Dardanelles*: Kalamasitaro—; *Deccan*: Makkajari, Makkajowari—; *Dutch*: Mais—; *Egypt*: Durra—; *English*: Indian Corn, Maize—; *Ewe*: Akple, Blikple—; *Fanti*: Abru, Aburow—; *Fiji*: Sila ni papalagi—; *French*: Blé de Barbarie, Blé d'Espagne, Blé de Guinée, Blé d'Inde, Blé d'Italie, Blé de Rome, Bléture, Blé de Turquie, Froment des Indes, Graine de Turquie, Maïs, Maïz, Mil d'Espagne, Gros millet des Indes, Troquet, Truquiet, Turquie—; *Ga*: Able—; *Garhwal*: Junala, Mungari—; *German*: Tuerkische Korn, Tuerkisher Weizen—; *Gold Coast*: Agbahdor—; *Guam*: Maeis—; *Gujerati*: Makkari—; *Hasada*: Jonra—; *Hausa*: Masara—; *Hindi*: Barajuar, Bhotta, Bhuta, Bhutta, Jawdra, Junri, Kukri, Makai, Makka—; *Hova*: Kasobotso, Katsamanga, Katzaha, Tsako, Tsakotsako—; *Indo-China*: Bao, Bap, Cennaron, Khao phot, Mali, Ngo, Ngoc thuc thu, Put, Sali—; *Iraq*: Indhrah safra, Idhrat-ash-sham—; *Italian*: Grano siciliano, Grano turco, Melicatto Meliga—; *Kashgar*: Conac—; *Khasi*: U riew hadem—; *Kila Saifulla*: Makai, Maki—; *Konkani*: Maeo, Zonallo, Zondllo—; *Krepi*: Adakple, Blikple, Kple, Kpledzi, Watsikple—; *Krobo*: Blaifo—; *Kumaon*: Bhutta, Junala, Mukni—; *Kurdish*: Gumnah shami, Zurat zard—; *Languedoc*: Artho, Avari, Avati, Blamari, Blarama, Garouilhé, Garouillet, Millaral, Millargo, Millargou—; *Laos*: Khao phot, Khot—; *Lepcha*: Kun-tsong—; *Lynngam*: Soh rikhaw—; *Madagascar*: Katsabazaha, Katsakandevolahy, Sako—; *Malayalam*: Cholam, Makka cholam—; *Malta*: Frumentone, Granoturco, Indian Corn, Kamh irrum, Maize—; *Marathi*: Bonda, Maka—; *Menomini*: Apesapimin—; *Moldavia*: Popusoiu—; *Mundari*: Gorajonra, Gurulujonra, Jondra, Jonra, Loeongionra—; *Naguri*: Jondra—; *North-West Provinces*: Barajuar. Bhutta, Junri, Maka, Makai, Makka—; *Persian*: Bajri, Gaudumemakkah, Koshahemakki—; *Philippines*: Borona, Maiz—; *Portuguese*: Milho, Milho grosso—; *Punjab*: Barajuar, Chhale, Juar, Kukri, Kuthi, Mak, Makkei, Makki—; *Rajputana*: Mukkha—; *Roumanian*: Porumb—; *Russian*: Kukuruva, Mais—; *Sanskrit*: Kandaja, Mahakaya, Makaya, Samputantastha, Shikhalu, Yavanala—; *Santal*: Jondra—; *Sarakhala*: Makkai, Maki—; *Sema*: Kolakiti—; *Shahria*: Badaghariuari—; *Sierra Leone*: Amarsk Kabe, Nvin—; *Sind*: Barajuar, Makkai—; *Sinhalese*: Bada iringu, Tringu—; *South Africa*: Mealie Corn. Mealies—; *Spanish*: Maiz, Trigo de las Indias, Trigo de Turquia, Zara del Perú—; *Suto*: Poone—; *Tamil*: Makkasholam, Taraka cholam—; *Telugu*: Makkanzonnalu. Mokkajanna, Mokka jonnalu—; *Toba*: Makai—; *Tongking*: Bap ngo, Lua ngo—; *Transylvania*: Cucuruz—; *Turkish*: Misir, Sari dari—; *Twi*: Aburow—; *Urdu*: Makai—; *Uriya*: Buta, Maka, Mokha—; *Yemen*: Rumi—; *Zomba*: Chimanga—.

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The Rogue Buffalo, Kosi River, horn sweep 96 in., girth 17¼ in.

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SHOOTING WILD BUFFALO IN THE KOSI RIVER SWAMPS.

BY

J. E. HALL.

(*With one plate*).

It was quite by chance that I discovered there were a few Buffalo left in the exntensive Kosi Duars, descendants most probably of the numerous herds that once populated these jungles, which Ingles makes full mention of in his *Tent Life in Tiger-land*. Consisting of alternate stretches of high *Kas* grass and *Jhowa* (a kind of Tamarisk) scrub, extremely dense, and growing up to 20 feet in height in places; the jungle is intersected by numerous streams. These are either branches of the main Kosi, or subsidiary streams. Except for high ground in places most of the area is swamp, infested with tiny but extremely vicious mosquitoes. In places there are extensive thickets of dog rose and *Igar* (a peculiar type of tree with white flowers, overrun with red ants). Formerly these jungles especially along the Kosi and Ganges held innumerable Tiger, Buffalo, Hog-Deer, Pig, and occasionally a Rhino strayed in from further north (Nepal). It was in this area in the Purnea District that the Shillingfords made such mighty bags of Tiger. With the extension of cultivation however most of the jungle land has been cultivated; what remains is so small and so subject to annual inundations from the river floods, that little or no game remains. A few pig and an occasional hog-deer or nilgai, with sometimes a straying panther is the most one can find. It was after working with most disappointing results in these riverside jungles, with an expenditure of backbreaking effort that eventually I stumbled on an excellent block comprising some 20,000 acres of high *Kas* and *Jhowa*, which being a shooting preserve of a local Raja had attracted all the buffalo from the surrounding area. The migration of the buffalo being helped along by the extension of cultivation, and reclamation of former swamps. I, however, was lucky enough to know the Raja well, having played out many a hard fought polo match both for and against him. On my approaching him he gladly gave a general shooting permit; also not being extra keen about shikar he asked me to see if the jungle was worth preserving, it having been reserved years ago in his father's time; and with the increasing land values the settlement of the area for cultivation was practically the only course left open to him.

Tracking being out of the question, recourse was had to questing in the most likely places with the help of an elephant. Buffalo were found in fair numbers; but after bagging two of the largest herd bulls, as no solitary was seen, the writer was forced to the

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conclusion that many of the buffalo were half-bred, probably from tame buffalo run wild, and joining their wild brethren. This being I was told a not uncommon occurrence. The better of the two bulls shot had a horn sweep of 93 inches with a girth of 19¼; the horns were very worn and splintered at the tips. Height from point of shoulder to hoof 62 inches (15½ hands). He was very heavy and massive and covered with scars. Being told by the junglewallas that April was the best month, when most of the rivers and streams were either dry or low, with the greater part of the *Kas* burnt, I decided on a shoot in April 1933, my intention being to bag a solitary bull. It was perfectly dreadful, excessive heat with a constant high breeze raising continual sand-storms. The skin blistered and peeled off most of my arms and face, my lips were cracked and bleeding after the first day. I tried to do too much and eventually had to give up with sore eyes caused by the amount of sand that had got into them. The shoot however was worth all the discomfort, a really fine solitary bull being bagged on the fourth day, besides some enormous 'Croc'.

We used to start out from the mango tope on the fringe of the jungle, where camp was situated, on the elephant about 4 a.m., swim two streams of the Kosi, and quest the most likely places on foot. The party comprised two locals, my orderly and myself. Getting the bull was sheer luck, we had had a very trying day and were resting in the shade of a high bank when the sun was at its hottest, about half past one. There were a couple of cotton teal in an open bit of water about 80 yards away and I took a pot shot with the little .22 bagging one. One of the locals waded out to get it, he had hardly gone 15 yards when he ducked under water, made his way with only his head above water to a small patch of reeds, and motioned with his hand for me to come at once. With great caution I waded out to him, with only my head above water and the rifle likewise held clear. Putting my head above the reeds and looking in the direction indicated, I got the shock of my life. 40 yards from me there was an enormous head on the surface of the water. As the owner would shake his head to drive away the flies his huge horns would show. To take a correctly placed shot was quite out of question as his body was practically submerged. I gave a shout. The effect was electric, the bull heaved himself up and I fired at right angles behind the shoulder. After a desperate stumble he caught sight of the orderly and the remaining local who were climbing up the bank, and went all out for them. Passing me within 10 yards I let him have the other barrel in the neck; it did not seem to have the slightest effect. I just managed to get in a third shot into the small of his back as he topped the bank, and then the fun started. Rushing up the bank after him we just managed by leaping into a small nullah to avoid a most vicious charge. He then went into some horribly dense wild rose thickets.

Following up the blood spoor, we experienced another charge from the side, but this was not too effective as he blundered into an *Igar* tree. I let him have another shot in the chest and

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he came down. The orderly, silly ass, in a wild desire to 'hallal' the bull grabbed hold of one of the horns and after that did not know what hit him. He was sent backwards at least 10 feet by the dying sweep of the horns. His thigh was severely bruised, at one time I thought it broken, and he could not walk for days afterwards. Had the point of the horn struck him his number would have been up. The bull, however, was a grand beast, typical solitary, with horns 19¾ inches in girth, 109 inches tip to tip across forehead, 17 hands in height. I checked these measurements with the greatest care. I have never seen a more massive animal.

I had been granted permission to shoot one cow buffalo, but so far had seen nothing exceptional, though heads of 7 and 8 feet (as far as I could judge) were seen. However, by this time I had got to know the jungle better and my uncle who had arranged to join me, in the meanwhile decided against foot-slogging; his weight is nearly 14 stone. We decided to return in October. Towards the latter half of that month we marched nearly 18 miles from the station in pouring rain and pitched camp in the Raj Katcherry. The tehsildar had obtained the loan of two staunch elephants. Without going into detail I may state that between us we bagged a fine bull, though not as big as the one obtained in April; this was uncle's, though I had to help hard, especially as he went for my elephant. We also shot a really fine cow. This latter cost us two days hard work, but eventually we managed to isolate her from a herd of some dozen individuals and I got her in two picked shots without indiscriminate firing as is usual in bagging a herd animal. She was worth the trouble and effort, her horns measuring 13 inches in girth and 112 inches in sweep. This cow was very old and scraggy. I was also compelled to shoot a fine young breeding cow who charged and chivvied my orderly and the skinners. She would not leave a certain patch of jungle, where we afterwards found a young calf. I felt so cut up about this that I abandoned the shoot. We tried to rear the calf but it was sickly having some sort of cow-pox, and it succumbed after a few days.

Some time later I had rather an amusing letter from the tehsildar, part of which I give below:—

SRIMATA,

21*st March*, 1934.

'MY DEAR J. E. HALL, ESQ.,

I did not receive any letter since a long time. Perhaps you have forgotten me at all, but I, don't. I have reported that the buffalo who was shot by your uncle, has become lame, and now it is turned into ferocious condition. One man has been wounded by that very buffalo and he died as soon as he was approached to —hospital, etc, etc.

Yours sincerely,

AZIZ KHAN,

Tehsildar.'

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This was serious for, as far as I knew, neither uncle nor myself were responsible for wounding any buffalo. I was unable to obtain leave just at the time, and before I could get away two more men had been killed. Eventually I went with a friend and we succeeded in bagging the culprit, a herd bull, probably a crop raider, who had two hammered lead slugs in him, on the forearm and shoulder. It appears that he used to lie up near water and if anybody, cowherd or grasscutter passed his side he would rush and gore or trample them to death. When he was shot he had three deaths and some four maulings to his discredit. He had a habit of raiding the paddy fields, where most probably he got wounded from a machan, and going for anybody who attempted to drive him away. He was a fairly big bull 16 hands high, with horns measuring 96 inches in sweep by 17¼ inches in girth. His head is shown in the accompanying plate. My friend, White, who was with me on this shoot, and myself had a rather narrow shave from a herd of buffalo on this trip. We were sitting towards dusk smoking, when we saw a herd containing a fine animal which in the uncertain light we took to be a bull crossing a stream to our left. We rushed for the spot, and I almost bumped into the buffalo in question. To the sound of my shot there was a general stampede by the herd in the high grass in our direction and we had to run pretty fast to clear them. The animal fired at turned out to be a cow but with a fine head measuring 9 feet 4 inches in sweep (112 inches). My punishment consisted in carrying that head covered with blood, weighing at least 80 lbs. or more, for very nearly 7 miles. We lost our way in the dark, floundered into swamps, and did not get into camp till the night was half passed. I refused to abandon the head under any circumstances.

Reading the above one must not get the idea that we habitually shot cows, in fact only three were shot during the course of three years, of which one was in error (the one above), one for a collection (the first), and one in sheer desperation to avoid a tragedy.

When the heavy jungle is taken into consideration it is really a wonder that more accidents of a like nature did not occur; we were however most careful on this point, and once I let a beautiful cow go, with I think at least 12 feet horns (sweep); she would have been a trophy worth keeping in a national collection, but she had a small calf at heel, and so was not molested. I never saw her again in spite of hunting for her for days at a time, with a cine camera.

It should also be borne in mind that arrangements had been made to clear the jungle for cultivation; and if we spared, the villagers did not. I rather flatter myself that as a result of a personal appeal to the Raja and his Estate Manager it was decided to stop the removal of the jungle and declare the area a closed preserve. This has been done, and though I lose by not being allowed to shoot, it is much the better arrangement; as I think that the wild buffalo is a species that is fast dying out and in need of very careful and strict preservation. I have since had a

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couple of days after hog-deer and panther in these jungles and note with the utmost satisfaction that the wild buffalo are increasing, so much so that I think steps will have to be taken to reduce their numbers, by shooting out obviously half bred and inferior animals. The area being circumscribed can only support a limited number otherwise pox and rinderpest will take toll in a drastic fashion. Now a few notes with regard to kit, etc.

Use the heaviest rifle you can, mine is a 450/400 H.V. double barrel; bullets should be either solid or with just the tip exposed, a split bullet breaks up on impact and has no penetration. The best shot I find is at the triangle. Pig-sticking taught me this. The triangle is that part of the back about 12 inches by 9 inches just behind the last rib, and level with the spine. If you get the spine the animal is paralysed in the hind legs and cannot move, if you go a little low the bullet takes him in the kidneys or liver and he cannot go very far. Unless perfectly placed low down a lung shot leaves an animal with plenty of go and he may take you far with the chance of a charge in the process. When questing on foot, search all the open spaces in the high grass between the heavy jungle and the crops up to about 8 a.m. You usually find a bull or so grazing after a night out. In the hot weather quest along the banks of streams in the jungle or stalk the wallows and pools, the best time for this is between 12 noon and 2 in the afternoon. Again in the evening quest along the maidans as in the morning for the buffalo coming out to graze at night. Following them up in the dense cover that exists is impossible and decidedly dangerous.

Buffalo horns go in all shapes though the bulls have mostly horns set in an arc of a circle, either more or less circular. Cows on the other hand show great variety: turn over horns are common, straight out from the head is another type. I do not agree with there being two varieties of buffalo, in my opinion there is only one type, with variations, either due to environment, or interbreeding with tame animals run wild. Shooting on foot is the cream of the sport though fearfully exhausting in the hot weather; shooting off elephants in heavy cover if only one or two elephants are employed requires profound patience, and a considerable knowledge of woodcraft. Shooting with lines of elephants is glorified butchery, which I have no experience of. When shooting off an elephant in high *Kas* jungle, where the buffalo are invisible at any distance beyond a few yards, an invaluable tip is to look out for paddy birds (egrets) who settle on the backs of the animals to pick off ticks, etc. Any wheeling by such birds about a particular spot is a sure indication of the presence of buffalo. You should also have a shot gun loaded with 'Lethal' ball handy as very often a hog-deer rises up practically under the elephant's trunk. I once lost a fine stag by not being prepared. In this way I have been lucky enough to bag some good hog-deer and *kakur* or barking-deer. An occasional panther is sometimes raised, but as a rule these brutes squat in a bush and refuse to move unless almost stamped upon; and when they do break all one sees is a flash of yellow and black. It is far more convenient to sit on

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the pad and drive the elephant oneself, in this way there is no chance of the mahout getting in the line of sight. I have heard of one unfortunate's head being blown off by an excitable griff. Moreover you are in the best position to take a snapshot. Driving an elephant is not difficult of attainment especially if you tip the mahout to show you the particular tricks of his individual beast. Always have the mahout on the pad behind you, as he can also control the animal by command. Shooting off a howdah makes the shikari frightfully sick, besides which howdahs are very seldom obtainable. Some practice is necessary to shoot off an elephant with any accuracy. I usually fix a light slip of wood with insulating tape along the barrels; this covers my sights and permits my using the rifle as a shot gun. Elevation should be judged according to range, but in actual practice shots are seldom taken beyond point blank distance. Avoid shooting a head out of a collection of bulls, these are usually good though inferior to the solitary bulls. These gatherings are of younger bulls too undeveloped to contest for the mastery of a herd, and if you do shoot one you may find yourself in a predicament with the remainder refusing to leave the dead one and pawing up the ground, smelling the blood, bellowing, and generally making most trying demonstrations, which if there is not a tree handy as once happened to me is decidedly bad for the nerves. Avoid a cow with a calf like poison, meddling with her means that you will have to shoot darned fast and straight in the end to avoid someone being hurt. Look at the base of the horn with a good glass, if it is flat, triangular, with a frontal breadth of at least 8 inches and heavily corrugated it's a bull. A rounded smooth horn with very little taper in the first half of its length belongs to a cow. Spread in a head is just as important as length, so try to bag a bull with the tips of his horns well apart. Horns and skulls are easily cleaned and mounted on shields, see that you pour kerosine oil or turps at frequent intervals into the outer sheaths to avoid excessive shrinkage and beetles, which otherwise eat horns away from the base. The hoofs mounted in silver make delightful and unique ashtrays (half a hoof well dried and polished), I have a couple which are the envy of all who see them.

Reading through these notes I find that I have commented rather freely on the charging habits of wild buffalo. Naturally I remember best the shoots that were more exciting, but on the whole with our modern rifles I do not think that shooting wild buffalo is any more dangerous than pig-sticking or following up a wounded tiger. In nine cases out of ten the bull is dead before he realises what is happening. It is the tenth case, when following up a wounded beast, or one that has had a slug in him from some cultivator's gun, that produces the incidents and occasional accident. I did hear that a couple of sportsmen had been injured during previous years, and in both cases they were entirely to blame for using shot-guns or rifles totally inadequate for the purpose. One man who was using I think a .280 Ross got a couple of ribs and a leg smashed. I consider he was lucky to get away alive.

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As regards how buffalo charge, in dense cover there is usually no time to note particulars. All one sees is an immense head and horns, accompanied by fearful crashing in the thickets at a distance of 5 or 6 yards. If your luck is in he passes to your front, if not and he faces you I really cannot advise you how to manage, I usually dive behind the nearest cover and let him have a shot when he pulls up in indecision before making up his mind to follow you. I can speak with greater certainty as to how they charge elephants, as I have on three occasions been charged or seen another charged. In each case there was a preliminary grunt, low and subdued, followed by a trot with the nose up, horns well back across the neck. The horns were only lowered when about 10 yards distant from the elephant, when the trot was changed to a series of bounds. The actual strike with the horns was made with a sideways sweep. I have seen an elephant horribly gored in the region of the stomach, the horn penetrating some 8 or 10 inches. This was a case where a cow sitting in high grass absolutely jumped up at the elephant, the elephant fled being pursued by the cow who gave her a good shove behind whenever possible.

These preserved jungles were very fine, one could moon round looking at buffalo and taking photographs, if not actually shooting, whilst mighty boar and fine heavy hog-deer kept the senses sufficiently alert to fully appreciate the snap-shooting practice one used to indulge in as a light-horseman in the Volunteers. It was a delight to slay Mugger. These ugly brutes were in every swamp and creek, and grew to immense size—17 feet in length being the biggest we ever got. The number of brass and copper bangles and anklets we got out of their stomachs surely couldn't have come from corpses only. Gharial or long snouted crocodile also went to great length in the Kosi streams; the biggest we ever got was nearly 23 feet from the tip of his snout to the end of his tail, the lumps on his nose were as big as saucers: this brute also disillusioned me as to this type being purely fish-eaters, as when cut open we took out of him a child's thigh bones complete with silver bangles as well as a flattened brass 'Lota'. In addition small game of all descriptions was to be had with little or no trouble, snipe, teal, black and swamp partridge, quail, peafowl, and an occasional florican (Lik or lesser species). Storks, waders and kindred non-sporting birds were in their legions in every swamp, whilst in the paddy-fields the wary Koolung or Demoiselle Crane could be stalked and bagged for the pot with the light rifle.

Measurements recorded are as follows:—

A. Big Bull Buffalo with self just after being shot, horn sweep 109 inches, girth 19¾ inches. Height after being properly laid out 68 inches.

B. The Rogue Buffalo, horn sweep 96 inches, girth 17¼ inches.

C. Cow, sweep 112 inches, girth 13 inches, tip to tip 49 inches.

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To anybody wanting expert information on the Wild Buffalo, I can recommend J. D. Inverarity's excellent article in the Bombay Natural History Society's *Journal*, vol. x, No. 1, of 10th November 1895.

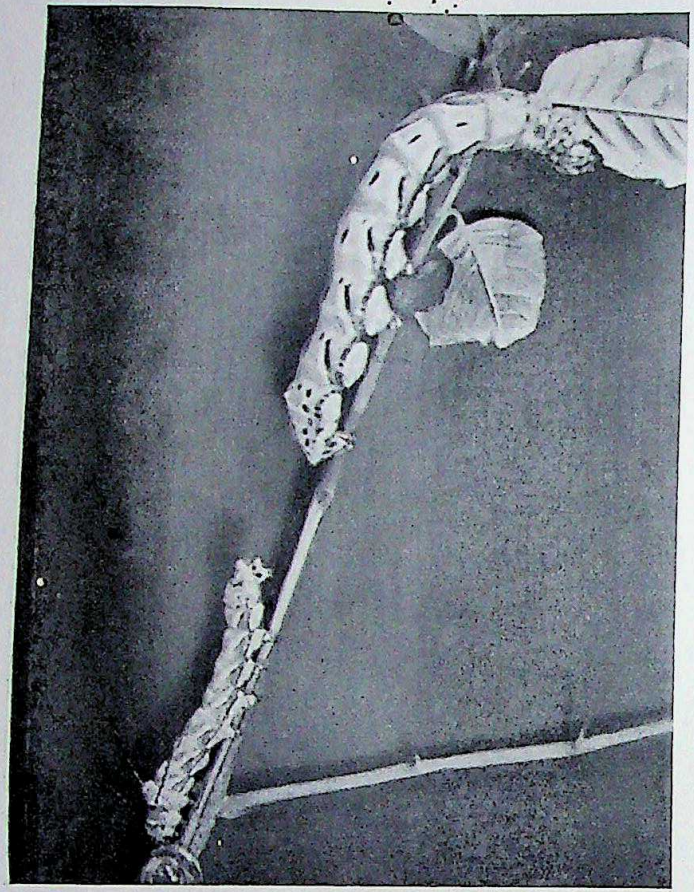
For Wild Buffalo Shikar I think Assam is the only province where the average shikari of moderate means can meet with any success, though even there I should think that anything over 108 inches in sweep is rare.

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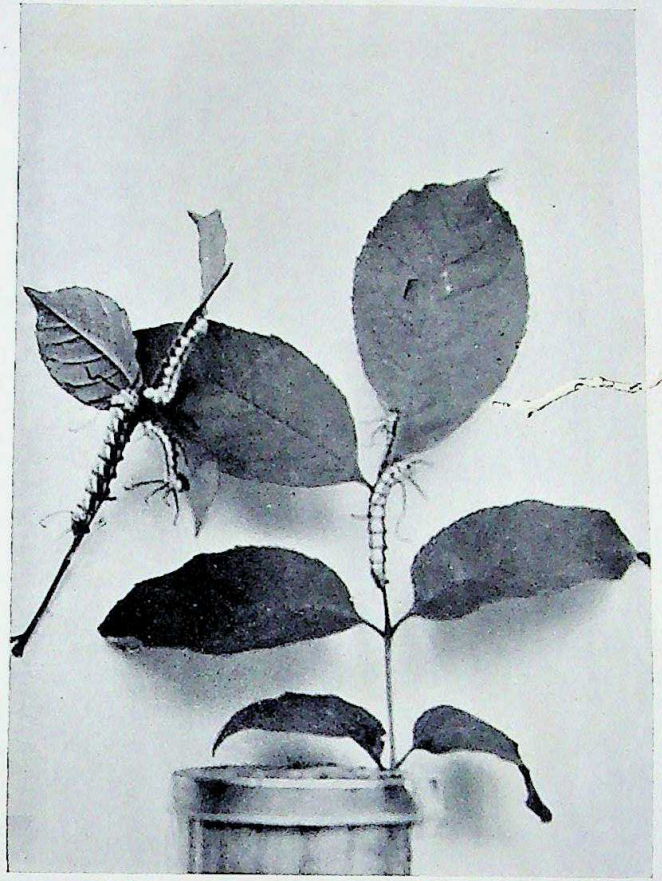
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A. Larvae Nos. 2 and 5 of *Brahmea wallichii*, rather less than full size.



B. All five larvae of *Brahmea wallichii* on ash-twigs.

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THE LIFE-HISTORY FROM EGG TO PUPA OF *BRAHMEA WALLICHII* GRAY.

BY

MAJOR J. A. GRAHAM, R.E.,

Headquarters, Meerut District, Dehra Dun.

(*With 2 plates and 4 text-figures*).

Having had the opportunity to rear some larvae ex-ovo, the following details of this peculiar species may be of interest to lepidopterists—more especially as I am informed that the life-history is not known.

At Naini Tal on June 27th 1935 I received from a friend a female *Brahmeid* moth, which during its incarceration in a cardboard box had deposited 37 ova. The moth was so worn as to be worthless as a cabinet specimen, and it was released on the trellis-work of the bungalow verandah, over which was growing common honeysuckle. Next morning 10 more eggs were found on the trellis where the moth had been placed.

Ovum.—The egg is almost three-quarters spherical, on a flat base, and very slightly depressed at the distinct dark grey micropyle; colour pale yellow, darker tinged near summit; diameter 2.5 mm., height 1.8 mm. On the eighth day the colour is grey with a deep brick-red area round the summit. On the tenth day the head and black and grey colouring of the larva inside are plainly discernible; the larvae hatched on July 8th, the eleventh day from deposition of ova.

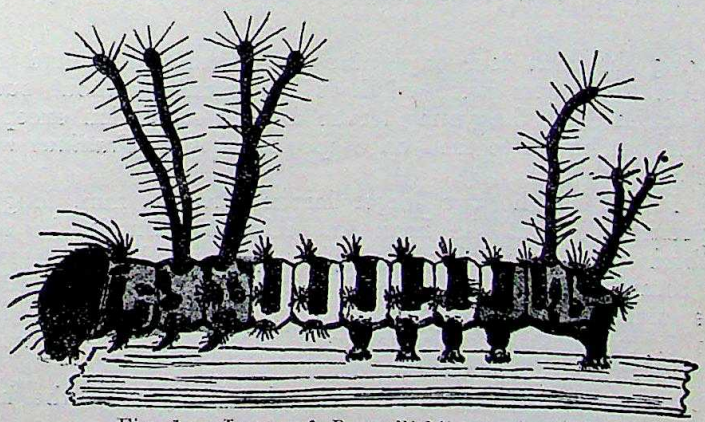


Fig. 1a. Larva of *B. wallichii*. × about 10.
Side view, 36 hours old. Length 7.0 mm.

Larva.—On emergence the first meal is the egg-shell; some eat practically all, some have only a few nibbles. The larvae

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present a most peculiar appearance, and look much too big for the shell they emerge from (Fig. 1a.). Length at 36 hours of age is 7.0 mm., and the longest fleshy protuberance or 'tentacle' is about 3.25 mm. The general colour is greyish white with black transverse bars, and yellow with black markings on the first three and last two somites, the 'tentacles' being black.

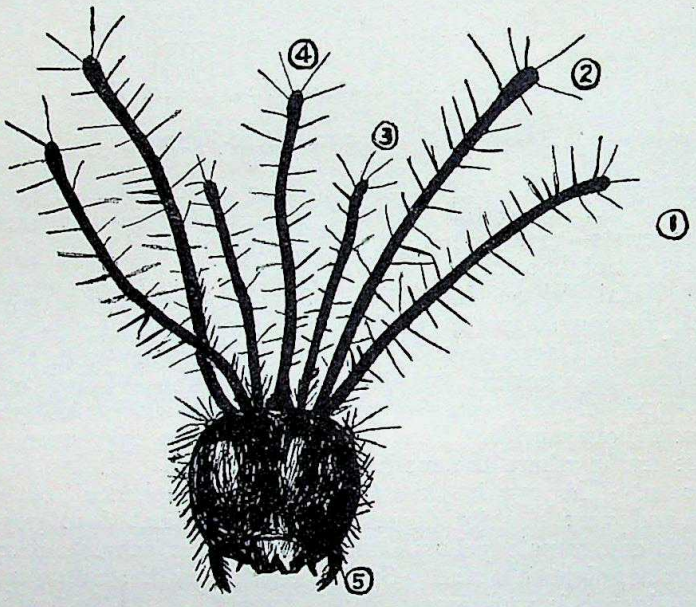


Fig. 1b. Front view of larva of *B. wallichii*. × about 15.

(1) 2nd somital pair of 'tentacles'. (2) 3rd somital pair. (3) Anal somital pair. (4) Anal somital (single). (5) 1st pair of true legs.

During the next four days nineteen different trees and shrubs and several creepers were tried as food-plants without success; in consequence all the young larvae died of starvation except five which at last began to feed on a species of Ash (*Fraxinus macrocantha*).

On July 14th the two larger larvae were 14 mm. long, and very plump, so that the head was relatively small; the second and third somites were pale yellow and swollen. These two larvae completed their first moult between 8 p.m. and 12-30 a.m. on the night of July 15th-16th. The moulting position for all moults is on the underside central rib of a leaf or of the leaf-stalk, preferably head downwards.

The remainder of this account deals chiefly with the history of the largest larva as typical.

Fig. 2 shows the changes that result from the first moult. The black bars are reduced to two longitudinal marks per somite, the sublateral and ventral surfaces are yellow, and each somital joint is tinged with yellow. All the bristles on the 'tentacles'

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have gone, and the latter are much longer, peculiarly bent and kinked, and shiny black; the 'tentacles' are not moveable except in a general fore and aft direction by movement of the skin at

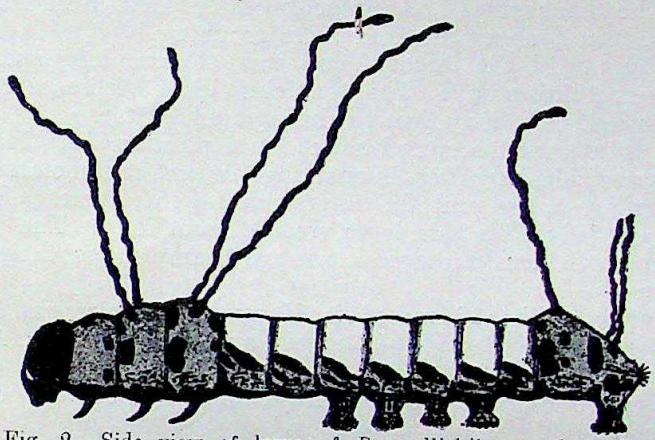


Fig. 2. Side view of larva of *B. wallichii*. × about 5. In 2nd instar. Aged 8 days; length 16 mm.

their points of attachment. All warts except one small anal one have also disappeared. The alarmed attitude is very similar to that of a *Sphinx ligustri* larva, but the head is even more recurved as it touches the sixth somite.

On July 19th the larva was 20.5 mm. long and preparing for its second moult, which took place early a.m. 20th. By 6 p.m. on this date the length was 24 mm.; the first pair of 'tentacles' 12 mm., second pair 14 mm., single anal one 7.5 mm., and anal pair 5 mm. Thickness of larger pair about 0.2 mm. The head is now marked with black bars on a greenish yellow ground (Fig. 3). Body markings are as previously except that the each lateral and sublateral ones are finer. The sublateral portion of each somite is somewhat folded and wrinkled.

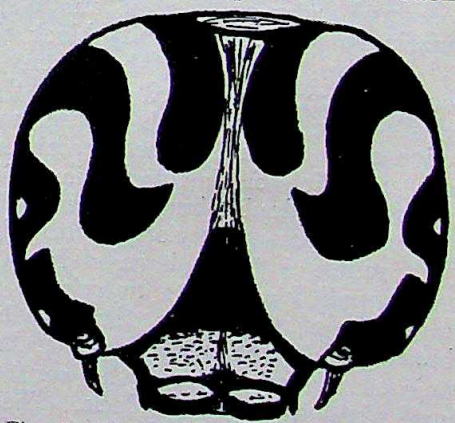


Fig. 3. Head of *B. wallichii*, × about 20. in 3rd instar.

The third larva was watched whilst moulting between 9-10 and 9-25 p.m. on July 21st. On emergence from the old skin, the head is like an unripe maize-grain, and the tentacles like irregular bits of greenish glass-thread; whilst drawing itself out of the skin the tentacles can be seen folded flat along the dorsum reaching to about the tenth somite. They are apparently not connected in any way with the old tentacles which are shed complete on the old skin. When the last somite is withdrawn

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by one or two jerks of the body, the larva uses its jaws to free the three anal tentacles from each other as they are more or less stuck together.

The head markings and tentacles of this larva were fully black by 10-30 p.m., about an hour after moulting.

On July 23rd the largest larva was 31 mm. long and preparing for its third moult. The tentacles do not increase in length or thickness with body growth during each instar.

The third moult occurred about 10-30 p.m. on July 24th. The only appreciable alteration in markings is that the sublateral black markings are wider and the intersomital joints more yellow. At 4 p.m. on July 25th this larva was 34 mm. long. The tentacles seem to have been damaged during withdrawal, as their lengths are now:—

1st pair right, 10 mm.; left, 18 mm.; 2nd pair right, 24 mm.; left, 17 mm.; anal single, 13 mm.; anal pair, 6 mm. each and slender.

The last 3 mm. of the anal single one is re-curved posteriorly like a hook.

When the second larva moulted for the third time, the tentacles also varied in lengths as below:—

1st pair right, 9 mm.; left, 17 mm.; 2nd pair right, 23 mm.; left, 24 mm.; anal single, 13 mm.; anal pair, 7 mm.

Plate II gives an impression of the front view of a larva in third and fourth instar in the alarmed position. The head is bent down in between the foremost pair of prolegs which are raised from the stalk on which the caterpillar is resting.

On July 27th the largest larva was 54 mm. long, average thickness of body 7 mm. Twelve hours later its length was 61 mm. The skin is now very smooth, shiny and well filled out. Plate IB shows the five larvae on food-plant.

On July 29th this larva prepared for its last moult, which occurred between 3 p.m. and 5 p.m. on July 31st. The head markings did not get fully black till about 7-30 p.m.

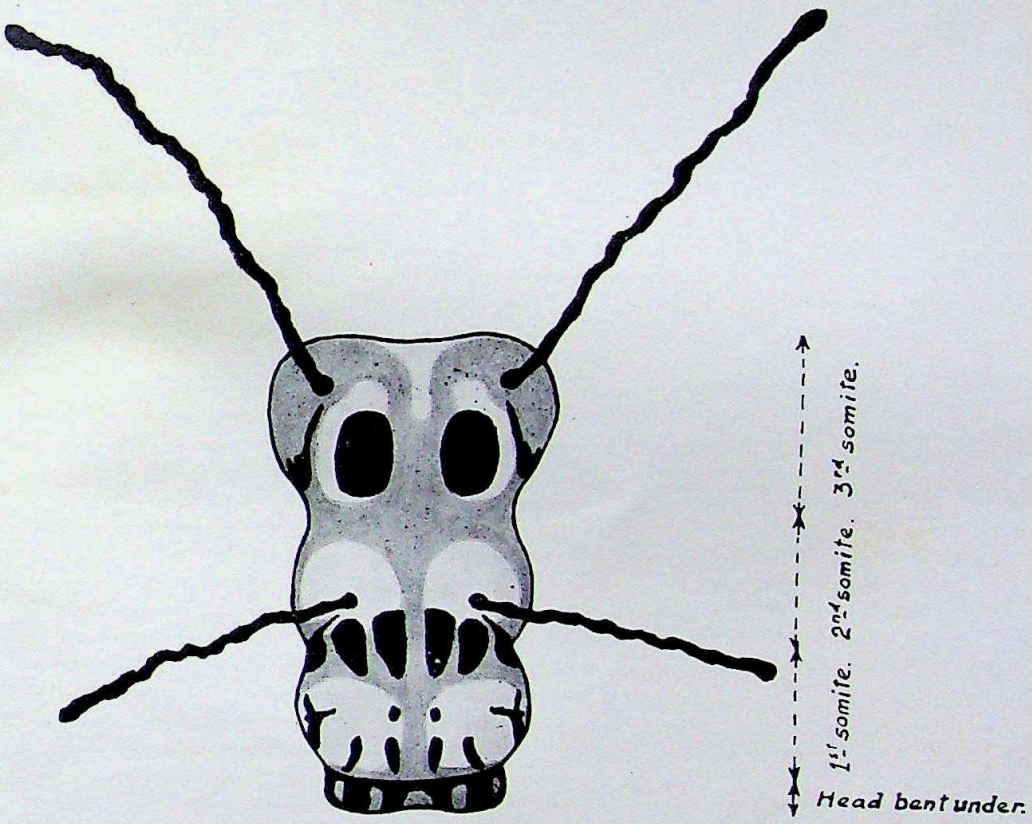
In this last instar the seven tentacles are completely shed; on the second and third somites they are replaced by oval-shaped chalk-white marks with a tiny wart in the centre, on a dirty olive-green ground. The lateral markings on first three somites are now fine black reticulations filled in with white. The third somite is double-humped and has a pair of large chestnut-coloured spots posteriorly, with black centres.

Somites 5 to 10 have a dorsal black cigar-shaped mark, and two small black dots anteriorly. On the anal somite there is no trace of the single tentacle, but a prominent hump with a blunt point; the posterior half has black spots where the last pair of tentacles were; the vent is surmounted by a triangular anal plate tipped with black. The ventral surface is dirty brownish with a medial black stripe and edged by the black sublateral lines which are much thicker.

Plate IA. taken on August 8th, shows the second largest larva in the last instar together with the smallest, which was rather a weakling, in its fourth instar one month after hatching.

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About x 3

Front view of larva, 4th instar, in alarmed position.

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On August 7th the largest larva, now 110 mm. long had changed its dorsal colouring to dull orange—obviously preparatory to pupating, as it was restless. An assortment of soil, stones, twigs, moss and bark was provided for pupation, but was not received with gratitude, and the larva duly pupated on August 13th on the floor of the breeding cage under a loose piece of bark.

The third larva attained a length of 114 mm. when full-grown.

The pupa is deep brownish black, naked, cylindrical, smooth but not shiny; length 44 mm. exclusive of anal spike which is strong, 4 mm. long and furnished with two small sharp points about .75 mm. long; diameter at lower edge of wing cases 14 mm.; at the base of the thoracic plate is a curious raised transverse feature, with a double pit or indentation centrally and a small pit at each side. Segments 8 and 9 have small knobs in the positions of the old prolegs.

None of the other larvae made any use of the materials supplied for pupation, and it is regretted that no notes can be given of their natural pupation habits.

After moulting the larvae must eat the old skin, as no traces were found after any moult (other than the fourth) except the head and bits of the old tentacles.

The appetite is enormous, and it is of interest that although by no means lethargic, the larvae do not wander, but prefer to remain on a particular twig until all available leaves and stalks are consumed. A move is then made to the next nearest twig providing a meal.

In conclusion, the following table gives the average periods for the various changes from deposition of egg to pupation.

Period in ovo ...	...	... 10½ days	Average total 50 days.
,, to 1st moult	...	... 8½ ,,	
,, to 2nd ,,	...	... 4 ,,	
,, to 3rd ,,	...	... 6 ,,	
,, to 4th ,,	...	... 7 ,,	
,, to pupation	...	... 14 ,,	

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A FISHING TRIP IN KUMAON.

BY

A. St. J. Macdonald.

(*With two plates*).

Assuming that anglers like myself scan the papers for new and up-to-date information of rivers to spend a fishing holiday on, I am writing this note of my recent trip up the Kali, Sarju, and Eastern Ramganga rivers in Kumaon. There is much which needs adjustment in Skene Dhu's book, in both the fishing water and the route to be followed. I worked the Kali or Sarda from Tanakpur to Pacheshwar, where the Sarju joins and up the Sarju to above Kapkote on the Pindari Glacier road, then over the Sema Pass to Tejam and down the Ramganga to Rameshwar where it joins the Sarju a distance of 280 miles of fishing water. In all this stretch of water the rivers need only be left in four places, and worked along above by village paths or roads. If given time, the water can be approached at certain points if one is prepared to descend and climb a few hundred feet. Kit can be carried along the rivers by Dhutials without whom it would be impossible to undertake the trip. The local Pahari or Kumaonee would let one down and ask extortionate wages. It must not be presumed by these notes that it is an easy matter to follow up the river-bed. Much boulder stepping and climbing is necessary to get by land-slides and cliffs, and in some places difficult wading from one bank to the other, but as long as marches are kept to five and six miles over the difficult stretches, the water can almost all be fished and good sport obtained.

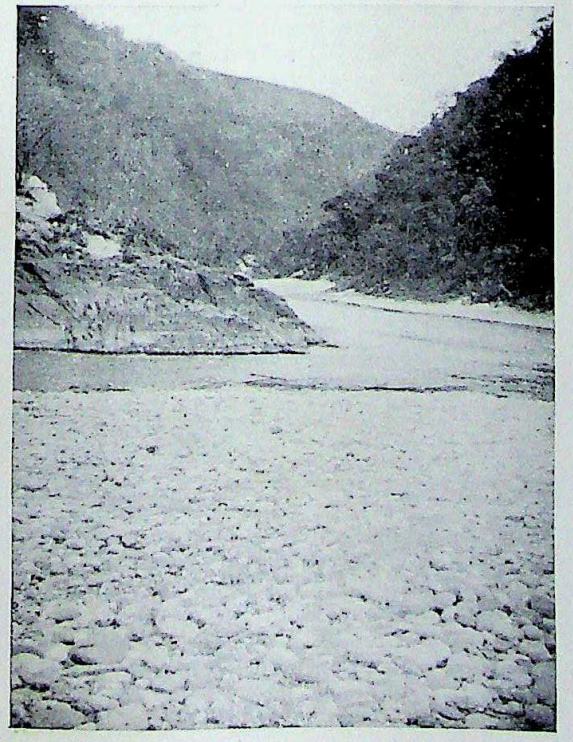
In the two months I spent on my holiday, I had fifty fishing days and caught with another rod (which was with me for a time only and fished only a couple of hours a day) 117 fish=946 lbs., over an average of 8 lbs. Five best fish scaled 96, 40, 36, 30 and 29 lbs. The best bag in one day was 16 fish to my own rod, and the best weight in a day was 117 lbs. for 8 fish, with Fly Rod. The best day was 16 fish=52 lbs., best 6½ lbs.

From Tanakpur one can follow the Kali to Chuka where the Ladaya joins 21 miles. From two miles above Chuka one must leave the river and climb over the ridge, a stiff climb of 5,700 ft. to a village on the top, Dabangaon—a distance of six miles. Camp here on the north side, and if the weather is fine, an excellent view of the snows can be had. From here march to Gurmacktashwar (14 miles). A dull march over open slopes and then a steep descent for the last two miles. The Loha Ghat stream joins in here. The river from here can be followed to above Kapkote and no further difficulty is experienced till below Tejam to Thal on the Ramganga. There is a wonderful gorge here, which must hold monsters, but it wants to be worked very

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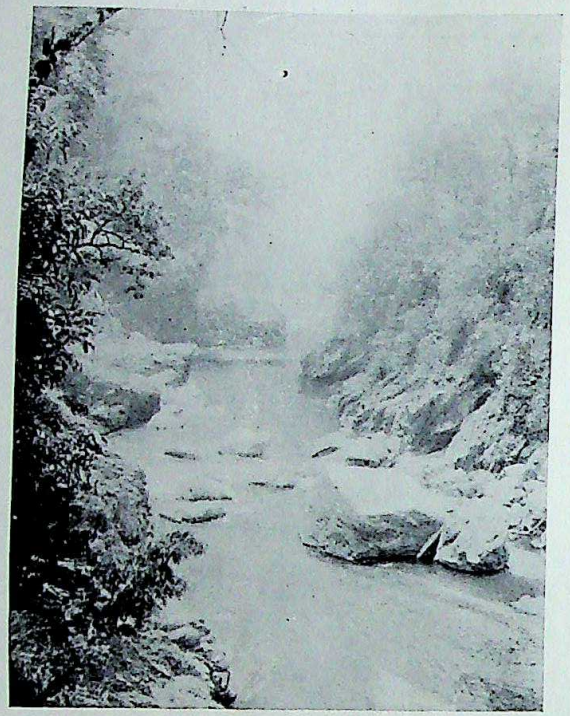
A morning's catch at the junction of the Ladaya with the Kali.



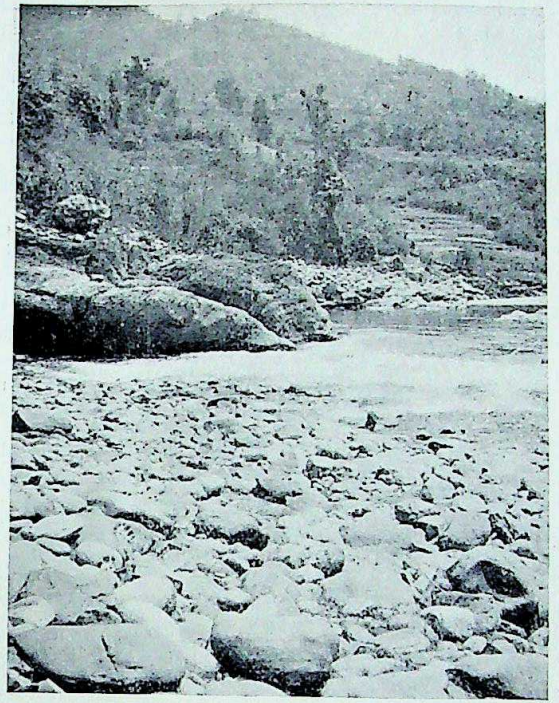
The junction at Pacheshwar showing the Temple Rock: the saviour of many a monster. My line was cut through 3 times in a day.

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A typical gorge on the Ramganga below Aulaghat, and a natural sanctuary for fish.



Big water with big fellows. I lost here a fish which left behind a scale 3¼ in. in diameter.

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thoroughly and in small stretches. The D.B. road is 600 ft. or so above the river, and much climbing is necessary to get to and from good water. The river is again difficult at a point below Thal at Munipani where it enters a gorge and is impossible for a mile or so, but the path along the right bank keeps near and above the river which can be approached in some places. From here to Aulaghat, water is good and can be worked to a point just below. Here again is a gorge, but a path leads along the face of a precipice for three miles and is but a few inches wide and takes time for the coolies to negotiate with loads. A false step or slipping stone would end in disaster several hundreds of feet below. The path should only be attempted if one has a good head for heights. From it is only eleven miles to Rameshwar. Intermediate water is excellent and can be approached anywhere provided one is prepared for heavy work in descending and climbing. These gorges are the saviour of the fish. They serve as sanctuaries, and are still unmolested by the hand of man. Wild and well forested they are the few remaining landmarks of the Kumaon of long years ago. This note read with Skene Dhu's book gives an idea of the rivers as they are today and the route to follow.

To those unacquainted with these rivers a note on tackle will be of interest. A ten-foot spinning rod and fly rod with wire traces for spinning and gut for fly spoon work meets one's outfit. The water is gin clear and the river small, so that unless one's tackle is of the finest, few fish will be caught. Spoon does not meet with success and Chilwa (or rather small fish for I never saw a Chilwa in the rivers) is far the most killing in the Sarju. Spoon is killing in the Ramganga. A small net is necessary for catching small bait and 150 yds. of line, ample. Like all Himalayan rivers the snags and rocks are sharp-edged and cut through gut or one's line like a knife. Killen wire is the best form of wire for traces and can be made up in a few moments. The places to fish are the same as in all rivers, in and below rapids or at the end of pools above rapids. The best time appears to be from the time the sun gets on to the water until it leaves it in the evening. Early morning and late evening did not meet with much success, and I found, once the fish started to rise after the sun left the water, it was useless continuing. Cloudy, rainy, and sunny days all gave good and bad sport so I would not speak for or against weather conditions. I think, for Mahseer anyway, the only element that matters is the water, and exactly how remains a problem to be solved. Fly spoon ½ an inch, I found better than any other size and gilt and silver seems to take best. At burning ghats, huge fish are to be seen cruising about but not to be tempted with either spoon or small fish. Atta I tried without luck, and meat if it can be obtained will provide a run or two, but the idea is repulsive, as anyone who has visited these waters will know. The moment a corpse is released the water is alive with corpse eating fish from 60 lbs. downwards. I tried a black and red spoon on these fish to try and represent their fancied though depraved taste, but met with

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no success. It is a waste of time fishing at these places as good fish are to be taken in the rapids above and below gorges where the country is wild and unmolested. Supplies like atta, rice, milk and ghee, are to be had in most villages. Fowls and eggs are scarce and expensive, so that a certain amount of tinned provisions, are necessary.

A few general remarks on shooting and the state of the country, may be of interest. In this connection I can only paint a picture of gloom. The fish are poached from end to end, from Pacheswar to Kapkote on the Sarju, and Tejam on the Ramganga. Fish traps, nets, spears and weirs to divert the water and leave the fish high and dry, for easy capture, are in great evidence. I have seen baskets of young Mahseer caught in this way by three or four children, so that with the colonising of the valleys, the destiny of these rivers for sport is gloomy, unless some enquiries are made and protection is enforced by the Civil Administration. A much more curious feature is that none of the commoner fishes of the Indian rivers are to be seen. *Rohu*, *Kalbash*, *Bowali*, *Tengra*, *Butchwa*, *Chilwa* and the other Carps are all missing. I examined baskets of fish and in such clear water it is easy to pick out the fish in variety. The local people attribute this to the Sarda canal headworks at Bombassa, whether this is a fact or not, it is one calling for investigation and immediate adjustment, if these rivers are to remain the fishing waters they are attributed to be. Game by the river is scarce, and it is pathetic to see Gooral, Muntjac, and Koklass pheasants down by the rivers in May because of the fires on the hills, which have driven them down for safety. The fire season is from April till the rains break, and hardly a hill side escapes unless it is a Regeneration Reserve for Cheer Pine. The damage to bird life (nesting at this time), insect life and the subsequent destruction of creatures which are driven down to the rivers and make easy prey for the numerous *Bundook Wallahs*, is deplorable. While fishing, I have on three occasions had Gooral on the opposite bank, within easy range of a shot gun. The haze caused by these fires is like a cloudy day, or the western sky in the plains when the Loo is at its height.

This is the Kumaon of today and unless a commission which includes experts in Ornithology, Pisciculture, and Entomology, are soon appointed to adjust this state of affairs, there will be little left but the terraced labours of man, and the dry springs of administration. And the day is in sight when there will be no fuel or or water available to provide for the ancient rights of the Sons of India.

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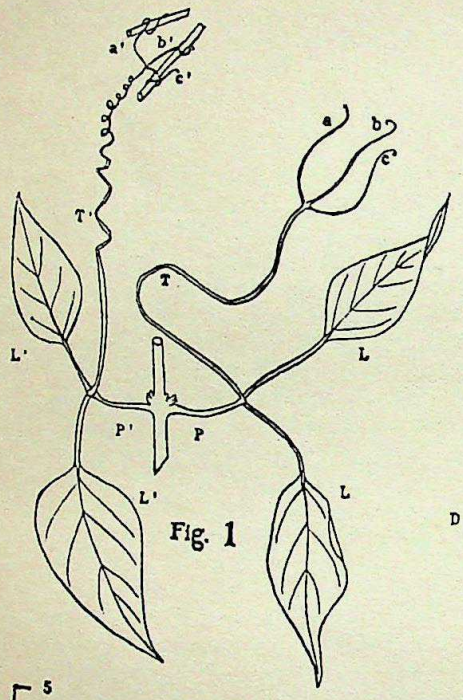


Fig. 1

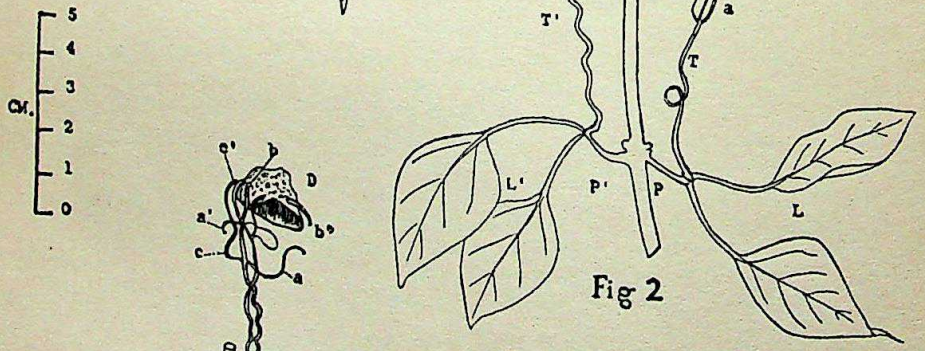


Fig 2

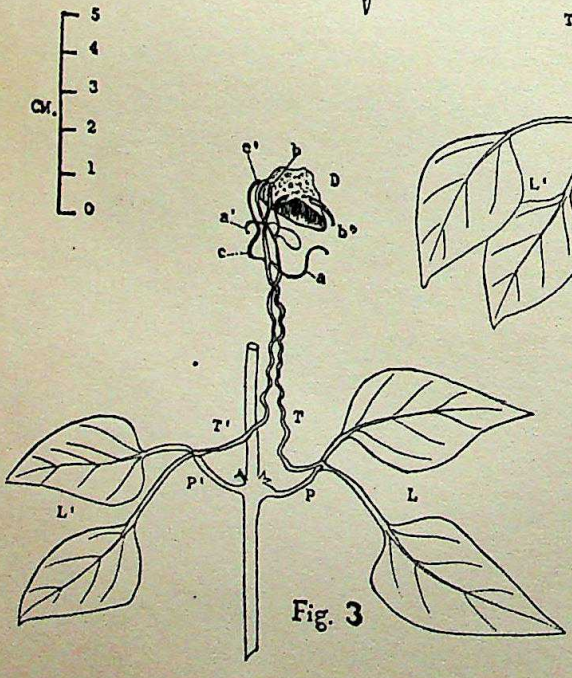


Fig. 3

Adhesive tendrils in *Bignonia venusta* Ker.-Gawl.

(For explanation of figures see end of article).

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ON THE OCCURRENCE OF ADHESIVE TENDRILS IN *BIGNONIA VENUSTA* KER-GAWL.

BY

J. F. R. D'ALMEIDA, B.A., M.SC.

(Professor of Botany, St. Xavier's College, Bombay).

(With one plate).

The formation in consequence of mechanical irritation of cellular outgrowths in the shape of 'discs', 'balls', 'pads' or 'suckers' on tendrils by means of which they attach themselves to rocks, walls, the bark of trees or other similar supports has been the subject of investigation by various writers, and Darwin (1), Göebel (3), Kerner and Oliver (4), and Pfeffer (10) cite several instances of such tendrils.

Amongst the AMPELIDACEAE adhesive tendrils have been observed in *Vitis hederacea* Ehrh. (=*V. quinquefolia* Lam., *Ampelopsis hederacea* DC., *A. quinquefolia* Michx., *Psedera quinquefolia* Greene, *Hedera quinquefolia* Linn.) (1), (4), (7), *V. inconstans* Miq. (=*Ampelopsis Veitchii* Hort., *A. tricuspidata* Sieb. & Zucc., *Psedera tricuspidata* Rehder) (4), (6), *V. capreolata* D. Don (=*V. Royleana* Hort.) (4), *V. ternata* Baker (=*Cissus paulinifolia* Vell.) (10), and *V. assamica* M. Laws (11). The tendrils of most CUCURBITACEAE show a certain proliferation of the epidermal and cortical cells and in *Sicyos angulata* Linn. and a few other Cucurbitaceae the fixation is aided by a viscid secretion (8), (10), whilst in *Hanburia mexicana* Seem. (1), (3), (4), (10), *Peponopsis adhaerens* Naud. (3), (9), *Gymnopetalum cochinchinense* Kurz (11), and *Trichosanthes pubera* Blume (=*T. palmata* Roxb.) (11) structures analogous to adhesive discs are formed. Similar outgrowths have also been observed in the BIGNONIACEAE, for instance, *Bignonia capreolata* Linn. (1), (3), (4), (10), *B. littoralis* H. B. & K. (1), (3), (4), (10), *Amphilophium Mutisii* H. B. & K. (=*Amphilobium Mutisii* Loud.) (10); and *Aplolophium* Cham. (=*Haplolophium* Endl.) (2). To this list it is proposed to add *Bignonia venusta* Ker-Gawl. whose tendrils the present writer has observed occasionally to produce similar adhesive masses, but before we proceed to deal with these it will be well to state a few facts known about these peculiar outgrowths in the plants that have already come under the observation of previous investigators.

Von Mohl was the first to show that such adhesive structures appear in response to the stimulus of contact with a firm body (6). They are usually formed by outgrowths from the epidermal cells and subjacent parenchyma, and they secure a firm hold of the support by growing into the irregularities of its surface and secreting a sticky substance or cement which completes the attachment (1), (4), (5), (10). Adhesive tendrils either require the stimulus of contact for the first development of their discs, e.g. *Vitis hederacea* (1), (4), (10); *V. capreolata* (4); *Bignonia capreolata* (1), (4); *B. littoralis* (1), (4); and *Amphilophium Mutisii* (10); or the suckers are pre-formed structures present as small swellings at the tips of the branched tendrils, and are simply excited to further development by contact. e.g. *Vitis inconstans* (1), (4), (8); *V. ternata* (10); and *Aplolophium* (1), (2), (3). Adhesive tendrils, though they all seem to agree more or less in being negatively heliotropic, i.e. in inclining away from light, show their predilection for a particular substratum. Some, like *Vitis hederacea* and *V. inconstans*, can climb up smooth walls and even planed wood, glass, and smooth polished iron, and form their discs upon these surfaces. Others like *Bignonia capreolata* require rough uneven surfaces, and seek crevices and crannies of stem and bark, and actually creep into them and there swell out into a club or ball and sometimes even fill up the cracks (1), (4).

Darwin (1) has given a pretty elaborate account of the tendrils of *Bignonia venusta*. They are modifications of leaves (Fig. 1). Each leaf consists of a petiole (P, P') with two lateral leaflets (LL, L'L') and ends in a tendril which is formed by the metamorphosis of the three terminal leaflets. Like the tendrils of *Bignonia unguis-cati* Linn. and some other Bignonias it has

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a fanciful resemblance to the leg and foot of a small bird. 'The lower part, or tarsus (T, T') is four times as long as the three toes (a, b, c and a', b', c'); these are of equal length and diverge equally, but do not lie in the same plane; their tips are bluntly hooked, and the whole tendril makes an excellent grapnel' (1). Kerner and Oliver (4) liken the claws at the ends of the delicate tendrils to those of insects' feet. Darwin also describes the manner in which the tendril seizes the support, but, it seems, his observations are restricted only to instances in which the tendril seizes an object which it can clasp by twining round it, for he makes no mention whatsoever of the peculiar cellular outgrowths or cushions which the present writer has seen to be produced on the tendrils under certain circumstances. The author's attention was first drawn to these structures by accident on a plant which was growing on the venetianed verandah of his residence. The climber had been trained some distance up the outer side of the verandah on a frame-work of thin wire. Higher up it was left to find its own way. In a short time some of the branches grew inwards into the verandah through the venetian blinds. On an examination of these inwardly growing branches a number of irregularly-shaped pads or cushions about 10-15 mm. in diameter and 6-8 mm. in thickness and of a creamy colour slightly tinged with green were noticed at the ends of the tendrils (Figs. 2 and 3, D). These masses adhered firmly, as if cemented, to the inner angles of the venetian shutters and looked like wax which had been poured round the edges of the slips of wood composing the blind and had solidified. On a further investigation it was found that some of the tendrils that had crept into the crevices of the venetian woodwork also showed a development of a similar tissue so that they could not be readily withdrawn, and, where the tendrils clasped a split bamboo post which presented many projecting points and fibres and fine crevices, the hooked ends developed into small irregular discs 1-2 mm. in diameter which adhered firmly to the rough surface of the post.

The adhesive pads of *Bignonia venusta* may appear separately on each of the three branches of the tendril should each of these meet with the requisite type of support (Fig. 2), or the outgrowths of branches (toes) of a single tendril or of two distinct tendrils may unite in a single mass (Fig. 3). Should a tendril or any of its branches not meet with a support it dwindles down and dies. But such free tendrils or their branches are frequently found embedded in the adhesive pads produced by a neighbouring tendril or branch of tendril (Fig. 3, b). Such encased tendrils can often be recognized by the hooked tips which may be seen projecting beyond the pad and which show no indication of swelling. There is reason to believe that the tendency to form pads is not restricted only to that branch of the tendril which meets with the type of support calculated to cause the development of the adhesive masses, but the stimulus to form such masses is transmitted to the other branches of the tendril which also develop similar outgrowths on clasping supports, such as wire, tendrils, stems, etc., which do not ordinarily cause the formation of adhesive pads. As regards their tropisms, observation points to the fact that the tendrils of *Bignonia venusta* are not negatively heliotropic as are the adhesive tendrils of most of the other plants mentioned herein. They have been seen to point indifferently in all directions irrespective of the source of the illumination. In regard to the type of support suitable for the formation of adhesive cushions or pads it is obvious from the foregoing that bodies presenting a surface with a certain degree of roughness can stimulate the formation of pads. Smooth walls, window panes and similar surfaces seem to produce no impression whatsoever on the tendrils which have been seen to droop and die in spite of being in constant contact with these surfaces, unless, however, they come across a support which they may clasp.

To summarize:—

Adhesive tendrils have so far been definitely known to be produced in the following plants:—

AMPELIDACEAE:— *Vitis hederacea* Ehrh.,
V. inconstans Miq.,
V. capreolata D. Don.,
V. ternata Baker,
V. assamica M. Laws.

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CUCURBITACEAE:—	*Sicyos angulata* Linn.,
	Hanburia mexicana Seem,
	Trichosanthes pubera Blume.
	Peponopsis adhaerens Naud.,
	Gymnopetalum cochinchinense Kurz.
BIGNONIACEAE:—	*Bignonia capreolata* Linn.,
	B. littoralis H. B. & K.,
	B. venusta Ker-Gawl.,
	Amphilophium Mutisii H. B. & K.,
	Aplolophium (Cham.) *sp.*

The tendrils of *Bignonia venusta* behave like ordinary tendrils when they come across supports which they can readily clasp—sticks, wire, etc. They form adhesive cushions, however, on contact with a body presenting a somewhat rough surface. The stimulus to form adhesive structures seems to be transmitted from branch to branch of a tendril. The inclination of the tendrils is independent of the direction of the light.

The writer's thanks are due to the Rev. Fr. J. F. Caius, S.J., of St. Xavier's College, Bombay, for his kind help in determining the synonymy of the plants mentioned in the paper, and for his valuable suggestions which have been embodied herein.

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EXPLANATION OF FIGURES.

Fig. 1.—Portion of a branch of *Bignonia venusta* Ker-Gawl. showing two opposite leaves and their tendrilar prolongations. P,P', petiole; LL'L'L', lateral leaflets; TT', tarsus; a,b.c,a'b'c', toes.

Fig. 2.—Portion of a branch of *Bignonia venusta* Ker-Gawl. the development of adhesive pads D, from two branches (a' & c') of a tendril. The rest of the lettering as in Fig. 1.

Fig. 3.—Portion of a branch of *Bignonia venusta* Ker-Gawl. showing union into a single mass (D) of outgrowths of the branches of two opposite tendrils. Lettering as in Fig. 1.

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REVIEWS.

I. AN ABRIDGED CATALOGUE OF CERTAIN SCUTELLEROIDEA (*PLATASPIDAE*, *SCUTELLERIDAE* AND *PENTATOMIDAE*) OF CHINA, CHOSEN, INDO-CHINA, AND TAIWAN. By W. E. HOFFMANN, Lingnan University Bulletin, No. 7 (1935).

The Catalogue of the Rhynchotan order Scutelleroidea by Dr. W. E. Hoffmann contains an admirably arranged list of genera and species of China and the neighbouring faunal subregions. It is an enlarged edition, with a great deal of additional material of the check list of the order published by the author in 1932. In 1909, Kirkaldy compiled a complete list of the World fauna of the group. Hoffmann's Catalogue makes an addition of 11 genera, 86 species and 12 varieties to Kirkaldy's list of 142 genera, 362 species and 20 varieties recorded from this region. To make the list as complete and up-to-date as possible, the author found it necessary to include two chapters of 'Additional species' and 'Addenda and Corrigenda' in the Bulletin. Throughout the catalogue he has followed a uniform method of arranging the genera phylogenetically and the species alphabetically following Kirkaldy's catalogue. As earlier literature is all listed in Kirkaldy's catalogue, Hoffmann has mainly confined the literature citations to works published after 1909. The geographical distribution of the various species is given in great detail. The 'Alphabetical list of genera and species' in conjunction with the 'Index to the genera, species and varieties' published at the end of the volume facilitates the location of different species, more particularly as the old names and synonyms are also indexed.

The very useful annotations added to the detailed bibliography fully define the exact scope of the different papers, monographs, catalogues, etc. and should enable students consulting the catalogue to determine the value of various references.

Appendices I and II contain notes on Faunal Sub-regions of Eastern Asia with special reference to China, and remarks on the Zoogeographical items with the aid of maps and the alphabetical list of about 600 place-names in Eastern Asia classified into general sub-regions, should prove very useful for workers in understanding the distribution of the species of the group; this is of special value as the names of many places, in China particularly, are not easy to find on maps that are generally available to most workers.

A cursory glance through the list of species shows the large number of species which are common both to India and China, and as the last volume of Distant in the *Fauna of British India* series was published in 1918 the present catalogue should prove very helpful to workers in India.

B. P.

II. THE SNAKES OF INDIA. By K. G. GHARPUREY, I.M.S. Demy 8vo. Pp. x+165; 29 diagrams, 52 illustrations. (The Popular Book Depot, Bombay) 1935. Price, Rs. 3.

It often happened in the past that in aristocratic families the eldest son was a kind of privileged being, whose future was being carefully planned and at times entailed sacrifices which were bound to affect his younger brothers who were supposed to shift for themselves. A similar spirit of favouritism obtains even nowadays among the scientific brotherhood, whose members write for their fellow-scientists and apparently do not care for those unfortunates who belong to the unscientific crowd! Hence the author is to be congratulated on having produced a popular book giving general information and useful knowledge about the various common snakes of India. Scientists may perhaps object that the book could have been written on other lines; but, if they do so, they lose sight of the author's aim which is essentially pragmatic—to let

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knowledge reach as many persons as possible. Accordingly the book has been priced at Rs. 3, which is a record-breaking low price for an illustrated book on snakes.

The author himself tells us that there is hardly anything original in this book and that the information it contains has been collected from divers sources and put together without its being made too technical. But if the book is not original in this sense of the word, it is nevertheless an interesting production which well fulfils the purpose intended.

The opening chapter gives general information about snakes, and is followed by a short note on animals confused with snakes—an excellent idea this. Various points, such as Teeth and Poison-glands, Snake Poison, Scales on a Snake, Classification of Snakes, Identification of Snakes, Protection against Snakes, Treatment for Snake-bite, are dealt with separately and form the subject of as many short chapters. By far the greater part of the book is devoted to the description of Indian Snakes. All through the style is simple without being obscure, and the matter is condensed without being jejune.

It may be noted that *serpens* is Latin, not French, and that *kattuvirian* is the Tamil for the Indian Krait and not for the Echis which is known as *suruttaippambu*.

In the reviewer's opinion it is regrettable that the author should on several occasions have made use of the word 'variety' instead of 'species'. The two words are not synonymous, and *species* is such a common word that it cannot be objected to in a popular book not strictly scientific.

J. F. C.

III. THE NIDIFICATION OF BIRDS OF THE INDIAN EMPIRE. By E. C. STUART BAKER, C.I.E., O.B.E., F.Z.S. Vol. IV (Taylor & Francis, 30/-).

It is with mixed feelings that one sits down to write the review upon this, the concluding volume, of Mr. Stuart Baker's great work, for to the reader, no less than to the author, there must always be a certain feeling of sadness when the word 'Finis' comes to be written.

On the other hand, it is a matter of supreme satisfaction that the final word has been written by Mr. Stuart Baker's own hand, and that he has been spared to place the coping stone upon the edifice, the foundations of which he laid half a century ago.

In tendering him our hearty congratulations, may we also add that it is characteristic of the author, and of his devotion to the cause of Ornithology, that he kept to the last the writing of this work which, one feels, has always been nearest and dearest to his heart.

For in addition to his innumerable contributions to Ornithology in the pages of *The Bombay Natural History Journal*, *The Ibis*, and elsewhere, and his volumes on the Indian Ducks, Pigeons, and Game Birds, it was not until he had completed his masterly revision of the Birds of the Indian Empire in the *Fauna of British India* series, that he embarked upon the work under review, which he has now brought to a successful conclusion.

In his preface to Vol. IV, Mr. Stuart Baker tells us that the *Fauna* deals with no less than 2,351 species and sub-species, of which the breeding of 1,723 species and sub-species is recorded in the present volumes. Of the residue, 349 are known to breed in countries outside the Indian Empire and Ceylon, whilst there remain 279 concerning whose nidification nothing whatever is known.

To the author, this figure of 279, or approximately 12 per cent, may appear large: to us, and we venture to say to our readers, it is well nigh incredible that it should have been possible to record, with such accuracy, the nidification of nearly 75 per cent of the total within Indian limits.

In this connection, may we express the hope that Mr. Stuart Baker may find it possible, in contributions to this *Journal*, to indicate where and when to look for the nests of some, at least, of the unknown 279? To give an example, the nidification of the Masked Finfoot (*Heliopais personata*), recorded on pages 316 to 318 of the present volume, was discovered at the first attempt in 1920, when two keen field workers happened to be located in one of the

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breeding areas of this bird, but it is quite possible that it would have escaped them but for the hint obtained and recorded by Mr. Stuart Baker as far back as 1901.

The present volume commences with accounts of the breeding of the whole of the Birds of Prey, other than the Owls, which were included in Volume III, and continues with the Pigeons and Doves, Sandgrouse, Game Birds, Megapodes, Bustard Quails and Quails, Rails, Waders and Waterfowl, and as in the earlier volumes exactly follows the classification of the *Fauna*.

The author also continues his system of trivial nomenclature, which indicates, in the English name, the habitat, appearance, or some other distinguishing peculiarity of the bird, a system which, we learn, has been very greatly appreciated not only by the general public, who are apt to boggle at long Latin names, but also by the scientifically minded.

Throughout the book, Mr. Stuart Baker maintains the same high level which he has set himself in the previous volumes, and when he permits himself the luxury of an occasional page of descriptive writing, he gives us a vivid word picture of a Himalayan mountain side or a Burmese jungle which adds immensely to the charm and interest of the work.

As in the earlier volumes, the author has collated all the older material, and to this has added a very great deal that is new, the whole being presented in his inimitable and eminently readable style. We give it as our emphatic opinion that no field ornithologist can afford to be without this magnificent work, quite apart from its value as a contribution to Ornithological Science, and its appeal to all those interested in Indian bird life.

The book is illustrated by seven beautiful photographic plates, and the printing is once again all that can be desired, and very easy to read. We would also add a word of praise for the great care which has evidently been expended upon obtaining the correct spelling of the innumerable place names which occur throughout.

C. H.

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OBITUARIES.

OSMOND CHARLES OLLENBACH.

Osmond Charles Ollenbach, formerly of the Survey of India, died at Mussoorie on the 6th July, 1935, aged 66 years.

Mr. Ollenbach was perhaps the doyen of Indian butterfly collectors, a fraternity which was in its hey-day in the more spacious times before the Great War. He himself used to comment on the decline of the hobby in India and attributed it partly to the lack of leisure and the more rigorous demands made upon people's time by the exigencies of life in the present day. Many enthusiasts had also left India on retirement and there were few to take their place.

Attracted to butterflies from childhood, Mr. Ollenbach took up the hobby of collecting as a boy in school, at Mussoorie. In those days the absence of works on the subject hampered serious study, but by the time he entered the Survey of India he found that opportunities for observing and collecting had so much improved that in 1900 he determined to start collecting seriously. In the next thirty years he captured and set about 17,000 specimens, comprising some 1,400 species, all of Indian Empire origin. To museums and learned societies in many lands he gave away 3,000 specimens and to other collectors over 5,000. The number now in the unique personal collection that he has left is roughly 9,000. They are most carefully preserved and scientifically classified in airtight cabinets, which Mr. Ollenbach loved to show to privileged visitors. Among those who saw his collection was Brigadier W. H. Evans—the noted authority on Indian Butterflies. In a letter to the Society, Brigadier Evans writes: 'I had corresponded with Ollenbach for many years but did not meet him until 1921, when our paths crossed in Burma. In 1922 I paid a visit to Dehra Dun and saw his collection not only of Butterflies but of insects of all Orders and I was very much impressed.'

Mr. Ollenbach's service years were spent in all parts of India, including Burma, the Andaman and Nicobar Islands, Kashmir, Hazara and the Himalayan region from east to west, and also Ceylon and Turkestan. In all these regions he had boundless opportunities of indulging in his hobby and more than once was helped by fellow-officers or friends who were keen naturalists.

Ollenbach was most generous in assisting other collectors and in presenting unique specimens to the Society's collections and to the South Kensington Museum. His knowledge of the habits of butterflies all over India and Burma were immense. Unfortunately he rarely wrote; but the Society has to thank him for several important notes and a comprehensive account of the Butterflies of Tavoy. Mr. Ollenbach also contributed articles and notes to Records of the Forest Department. Subsequent to his retirement he was employed as an Entomologist at the Forest Research Institute, Dehra Dun. After retirement he settled on

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his own estate at Dehra Dun and took a great deal of interest in his orchards. He leaves a widow and two sons.

WALTER ORMISTON.

Walter Ormiston was born in Hongkong where his father was the Manager of the Chartered Bank. He was educated at Rugby and after passing out as a Barrister at Lincoln's Inn, he practised at Hongkong. Finding the work uncongenial he gave up his profession and went to Ceylon where his family owned the Kalupahani Estate, at Keslande. He worked on the estate up to the year 1925, when he returned to Galle and made the Oriental Hotel his headquarters.

Ormiston was a born naturalist, his love of Nature and the out of doors, drew him away from the vocation for which he was trained. A keen fisherman—one of the most expert in Ceylon, he was the oldest member of the Nuwara Eliya Fishing Club. Animal and bird life attracted him. His observations were always wonderful; and as such he was a welcome and charming companion on shooting trips. He handled a rifle as cleverly as he handled a rod and was a keen member of the Ceylon Planters' Rifle Club. Stamp collecting was also one of his hobbies and as a collector he mastered the intricacies of his hobby and became an expert philantelist. But his chief claim to remembrance amongst naturalists will lie in his work on the Butterflies of Ceylon which he published in 1924. His experience as a collector and his close study equipped him for the task. He was in close correspondence with noted lepidopterists such as Brigadier Evans, Capt Riley and T. R. Bell. His work was based mainly on the collections which he made in Ceylon. They include long series of each species illustrating both dry and wet season forms and other variations. In writing his book he spent some time studying the collections at the British Museum. He gave the British Museum such Ceylon Butterflies as were unrepresented in their collection, besides many rare and abnormal forms. But the bulk of his collection of his Ceylon Butterflies he presented to the Bombay Natural History Society of which he was a member for twenty-five years. They are now preserved in separate cabinets as the 'Ormiston Collection'. His work as an entomologist will be remembered in the new species which have been named after him, this includes one species new to science named by Evans and Riley as *Amblypodia ormistoni*, two new races *Vacaduba herenice ormistoni* and *Terias andersoni ormistoni*. He died in the General Hospital at Colombo on July 12th, 1935, aged 71 years

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MISCELLANEOUS NOTES.

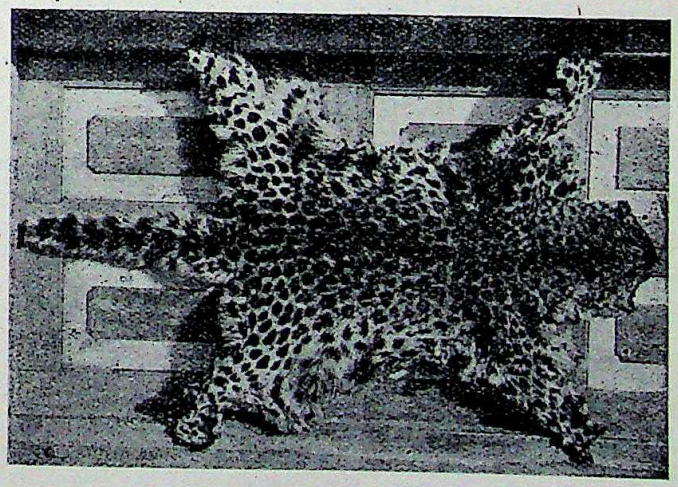
I.—TIGER VERSUS BISON.

With reference to a note in vol. xxxvii, No. 4 of 15th April 1935, anent a fight between a bull gaur and a tiger, Mr. W. S. Thom is mistaken in thinking that a tiger is no match for a full-grown bull bison. I have known at least six cases of solitary bulls having been killed by a tiger; about as many instances of unsuccessful attacks, including that of an old bull which had been severely mauled on its head, neck and shoulders and the near hind leg bitten through, the bone being completely severed. How this bull had managed to shake off the tiger after such a terrific mauling is difficult to imagine.

HONNAMETTI ESTATE,
ATTIKAN P.O., *via* MYSORE,
S. INDIA.
July 12, 1935.

R. C. MORRIS.

II.—OCCURRENCE OF THE PANTHER (*PANTHERA PARDUS* LINN.) IN TIBET.



Skin of a panther shot at Thakpo, Tibet.

The accompanying photograph is of the skin of a panther said to have been killed in Thakpo which is in the Tsang Po valley,

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Tibet. The only difference I noticed between this one and the common Indian panther is that the colours are richer, the hair thicker and slightly longer and the tail broader but shorter. Unfortunately the skull was not brought in to me.

POLITICAL DEPARTMENT,
LHASA.
September 29, 1935.

R. K. M. BATTYE,
Captain.

III.—FURTHER RECORDS OF THE DISTRIBUTION OF THE CHEETAH (*ACINONYX JUBATUS* ERXL.) IN SOUTH INDIA.

With reference to my recent letter to you about the occurrence formely of the hunting cheetah (*Acinonyx jubatus*) in South India I see from the list of *Mammalia* taken from an article written in 1875 by the Rev. F. W. Jackson entitled the 'Mammals of the Coimbatore District, 1875', that the hunting cheetah was then sparsely distributed in parts of the Coimbatore District bordering the river Bhavani near Vellamundi and Kottamangalam. Five skins of *Felis jubata* examined in the Coimbatore Collector's Office in 1871 apparently came from the low hills about Kottamangalam (near Satyamangalam). The skins are described as having been 'in good order and undoubtedly those of *Felis jubata*'. The skin of a *Felis jubata* then in the possession of Mr. A. Wedderburn, Collector of Coimbatore, was obtained near Bolampatti, south of Coimbatore. I have already given instances of the hunting cheetah's former occurrence in the Mysore State, so you will realise that the distribution of the cheetah extended southwards well into the Coimbatore District, possibly further south than that.

Nicholson, in his *Manual of the Coimbatore District* (1887) records the Hunting Leopard as occurring in the Kollegal taluk at Bandhalli and in the Mysore State at Bandipur.

HONNAMETTI ESTATE,
ATTIKAN P.O., *via* MYSORE,
S. INDIA.
November 1, 1935.

R. C. MORRIS.

IV.—DESCRIPTION OF A BLUE BEAR (*URSUS ARCTOS PRUINOSUS* BLYTH) FROM TIBET.

A skin of a Blue Bear (*Ursus arctos pruinosus*) was sent to the Society in November 1935 by Captain R. K. M. Battye, who in forwarding the skin writes: 'The bear is said to have been killed near Hor in Eastern Tibet. I am told that the species lives only in the bare mountains where there is no jungle and where there is snow lying for 7 months in the year. Vernacular *Tre-Mo* or *Tom-Dre*.'

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The skin is that of an immature animal, in general colouration it resembles the skin of an immature male from the Minshan Mountains, W. Kansu, presented to the British Museum by Capt. O. Fenwick Owen and described by Pocock (*J.B.N.H.S.*, vol. xxxv, p. 809).

Face, pale tawny, with a silvery sheen where the light catches the hairs. The basal portion of the hairs of the crown, cheek and forehead is dark brown, but this dark colouring is not seen unless the hairs are disarranged. A small patch of hair between the eyes brown; chin brown, ears dark ashy brown with an admixture of fulvous hairs. A distinctive collar of creamy hair interrupted in front of the shoulders where the dark basal part of the hair becomes more evident. The black of the shoulder mat is not very pronounced owing to the pale tipping of the hairs. This paling becomes more evident in the middle of the back, but is less pronounced on the loins flanks and rump where the pale tipping of the chair is less marked. Belly dark brown passing to yellowish brown on the breast. Limbs grizzled black. Claws pale, horn coloured. Fore claws 2½ inches, hind claws 1¼ inches. Hair on the shoulder mat 4-5 inches, on the back 3-4 inches.

BOMBAY NATURAL HISTORY SOCIETY, S. H. PRATER,
6, APOLLO STREET, BOMBAY. *Curator.*
February 12, 1936.

V.—RATELS AND CORPSES.

Mr. Clifford Hurst's letter in your issue dated December 1st 1935 brings the grave-digging habit of the Ratel out of the realms of 'Indian Superstition' to which Mr. Champion would relegate it.

A detailed enquiry amongst those whose business it is to deal with corpses, would further establish the Ratel's habits; and possibly more of your readers, whose business naturally does not lie in that direction, may nevertheless have come across isolated instances of grave-digging.

Mr. Champion has replied to my letter on the subject in a letter of his published on page 953 of your Volume xxxvii, No. 4.

A few comments on Mr. Champion's letter are called for, both personal and general.

In my letter to which Mr. Champion's purports to be a reply, I quote the case of Ratels habitually excavating in a grave yard and I gave a particular instance in which a Ratel (no other animal) had exhumed a corpse.

I expressly stated that this was only 'some' of the evidence at my disposal. Mr. Champion for his own convenience converts this to the 'only' evidence and finds it 'deplorable' that I should make statements on such flimsy foundations,

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The foundations are entirely of his creation for the special purpose of trying to meet an unanswerable case: moreover he entirely ignores the cemetery evidence: wisely.

Many people reading Mr. Champion's letter would conclude that he had hardly ever seen or encountered a Ratel, although his trip wires certainly have.

The letter contains no particle of evidence or observation whatsoever of any kind: much less in repudiation of the habit he denies. It goes further than that: it admits that he has never observed a grave yard: and definitely asserts that he does not intend to do so in future. One is thus left wondering how he proposes to support his contention: save by a process of transmigration. He certainly cannot observe corpses save where corpses are. It is time Mr. Champion told us when and where and under what circumstances, he has encountered Ratels, if at all, which give the lie to observed facts in regard to their habits: and in doing so he would gratify many, if he would tell us also of his personal experiences of the Ratel's courage, and which enabled him to confound his critics from a Bombay paper to which he refers.

BISHOPMILL,
ELGIN, SCOTLAND.
January 6, 1936.

A. A. DUNBAR BRANDER,
I.F.S. (*Retd.*).

VI.—RATELS AND CORPSES

With reference to the correspondence which has taken place in your *Journal* about Ratels and corpses, I should like to report the three following instances on which I saw Ratels at this work:

(1) In the Melghat Division in April 1926, I was sitting over a tiger kill two days old. In those days, one was allowed to sit up all night with an electric apparatus. I actually shot the tiger about 40 yards from the kill at 7-30 p.m. Being of the opinion that there was another one in the vicinity, I remained on in the tree. At some time between 11-30 and 12 midnight, I heard a noise which sounded like two animals fighting. It was a bright moonlight night and I saw movement near the carcass and watched these forms tearing and rummaging inside the carcass and fighting amongst themselves. I turned on my electric torch, as I was unable to make out what they were and discovered them to be a pair of Ratels. One looked up into the light and moved away about 20 yards, the other did not take the slightest notice. I picked up my shot gun which was loaded with lethal and tried to change over to shot, but the noise drove the animals away. They did not reappear.

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(2) In the Chakata Block of the Haldwani Division in December 1928, I was 'ghooming' in the early morning in the hope of finding a tiger or a panther on one of the tie-ups, or meandering about the road. I moved into a dry river bed (Nala) and about 200 yards off the forest track I got an odour of a carcass. In moving forward round the bend of the Nala which was all sand, I noticed a lot of tiger pug marks and saw about 60 yards away two Ratels scratching and scraping at something in the bed of the nala. I watched them for quite a long time. The earth flew and they seemed to be feeding on something dead, as the odour was pretty strong even where I was. After about 10 minutes, I shot one of these animals and on going up to see what it was, discovered it to be a human corpse which had been covered over with about 6 inches of sand. The part about the neck and the left shoulder had been torn and eaten by these Ratels. The remainder of the corpse was a good deal decomposed, and there was no doubt about it, that these Ratels had exhumed this body and were feeding on it.

(3) My third instance took place in the Jaulasal Block in the Haldwani Division in April 1933. I was wandering about on an elephant at dawn, and was shown by the mahout a Ratel moving across an open patch between two bits of forest. I watched the beast very carefully and suddenly I heard a noise as if there were more Ratels quite near. I told the mahout to make the elephant advance very slowly and quietly. After having gone about 20 yards I saw four Ratels on an old carcass of a cheetal doe. One was actually inside the carcass which was, I should say, three to four days old. Suddenly one of them saw the elephant and gave a queer little yelp and they all ran away. I did not move from the spot for about 10 minutes in order to see if they came back. The time must have been somewhere between 6-30 and a quarter to seven. To my amazement, two of the four returned and advanced slowly towards the carcass. They never reached it again, because I think they must have caught sight of the flap of the elephant's ears, as they disappeared very suddenly.

GOVERNMENT HOUSE,
BOMBAY.
January 25, 1936.

C. G. TOOGOOD,
Lt.-Col., D.S.O.

VII.—THE BIRTH OF AN ELEPHANT CALF.

With reference to Mr. Tutein Nolthenius's note under the heading of 'The Birth of an Elephant Calf' in the *Journal* of August 15th, in vol. xxxvii, No. 3, I referred to the death of a wild elephant while calving. This elephant was found dead lying on its left side with the hind quarters of the calf only exposed,

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On another occasion I happened on a spot where a cow elephant had calved on a sandy path in open scrub jungle; there was no sign of the placenta.

HONNAMETTI ESTATE,
ATTIKAN P.O., *via* MYSORE, R. C. MORRIS.
S. INDIA.
September 3, 1935.

VIII.—WHY ELEPHANTS TURN 'ROGUES'.

I wonder if any of your members has any information as to the real reason for elephants turning 'rogue'. The usual theory is that some old and cantankerous elephant is turned out of the herd, specially during the 'musth' or rutting period, by a more powerful male, and this old and ill-tempered fellow gradually becomes a confirmed 'solitary', and in time becomes dangerous to human life and property. My experience in the Chittagong Hill Tracts (on the borders of Bengal, Bihar and Assam) leads me to question this, for on at least three occasions, I was attacked by well-known 'rogues' which after being shot turned out, in spite of their commanding size, to be quite young fellows, with no signs of wounds or injuries likely to cause them pain or discomfort, which might turn them soured in temper. One fellow who very nearly got me, was quite small, standing barely seven feet at the shoulder, and must have been only a young lad, yet he had been by himself for months, in the plains during the rains, when all herds were away among the higher ranges. Every rogue I shot myself, and every other which was shot by others, and which I had the chance to examine, had undoubted need for a dentist for at the root of the tusks of each one of these animals, I found pounds and pounds of live maggots, which must have caused them excruciating agony. I am inclined to think that it is this tusk-disease, which makes them, young and old, so bad-tempered, and forces the others to kick them out of the herd. Whenever tracking a 'rogue' or 'solitary' (undeclared rogue), I have noticed that the animal frequently thrusts his tusks through ant-hills, or soft saplings, and as I have never seen the marks of tusks thrust through in this manner when a herd has passed, nor have I seen our tame elephants doing this, I feel that I am not far wrong in holding that they do this in order to relieve the agony caused by the maggots far inside their jaws. During my stay in that area, I tracked and followed up herds and solitaries—literally by the hundred, so my observations were not quite casual, and were spread over a period of nearly four years. I hope this may bring some light on the matter.

RANGPORE,
E.B.R. S. K. GHOSH, I.C.S.,
District Magistrate.
August 2, 1935.

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[Mr. R. C. Morris comments on Mr. Ghosh's letter as follows:—

'While agreeing with Mr. Ghosh that in many cases tusk disease is the cause of many elephants turning into rogues, this is by no means the cause in all cases, in fact most of the elephants I have shot or helped to shoot had no apparent disease in the tusks. Marginal *gum* disease of elephants is very common, occurring in the case of both wild and tame elephants, probably due to food packing under the gum, but this would not account for elephants turning into rogues. Frequently inflammation from old and fly-blown wounds may be the cause (the last rogue I shot had had its tail bitten off and the stump was diseased). Again in some cases there is no apparent reason for the elephant having become a rogue. In two cases this was undoubtedly due to the elephants' tusks being crossed, resulting in difficulty in feeding. Only in two cases was I sure the elephants' ill-temper was due to tusk disease. That elephants with tusk disease do thrust the diseased tusk into ant-hills and young trees is correct. A broken end of a tusk, about a foot long, was brought to me some years ago, the Sholaga had found it wedged firmly into a tree, and Sir Frank Colyer, to whom I sent the tusk, expressed the opinion that the elephant had been suffering from tooth-ache.

Seven or eight rogue elephants have been shot in the Madeswaranmalai Reserve in this district in the past ten years, one of these was definitely handicapped having tusks crossed so close to its jaw that the elephant must have experienced considerable difficulty in feeding itself, but the others were healthy animals, and I put their ill-temper down to the fact that their favourite grazing grounds bordered a much-frequented pilgrim patch up to the famous Madeswaranmalai temple. Nearly every day, devotees journeying up and down this path create a good deal of noise, especially once a week, and I think that this continual row used to irritate solitary elephants frequenting the bamboo jungle there. In every case the elephant was proscribed owing to its adopting an aggressive attitude towards pilgrims on this path.

I am convinced that one of the chief causes of elephants turning into rogues now-a-days is due to ryots firing at elephants raiding their fields. The herds are nearly always led by a bull. The ryots, who now nearly all have guns, cannot be blamed for their action in this respect, and it is up to Government to create a Game Department, which will take measures to prevent the continuous raids on fields that are now carried on during the harvest time by the increasing number of elephants.'—EDS.].

IX.—THE FORMATION AND ABSENCE OF TUSKS IN ELEPHANTS.

With reference to Sir Frank Colyer's article in the Society's *Journal* of 15th November 1930, and my comments on the same which appeared under 'Unerupted tusks of Elephants' in *Journal* 4, vol. xxxv, I enclose extracts of further correspondence on the

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subject between Sir Frank Colyer and myself which may be of interest.

Extract from a letter dated 11th November 1934 from Sir Frank Colyer.

'It is a most unusual condition for an animal to have one tooth absent and the other well developed. It does occur in the Narwhal but in that animal it is the normal. The tusk in many Indian elephants seems to be a degenerate organ. Is that not the case? That is, do not a good number of elephants fail to develop tusks? Is it only the females? Have the calves which have shed a tusk been followed up to see if the tusk which develops on the other side is a well-formed and grown tooth? It is most important to settle this question. I take it that in your view many elephants which have only one developed tusk have at some time possessed another small tusk which was shed in early years. Further you think that masses such as you sent me may really be formed from a tooth germ which has failed to produce a tusk in the proper way but has formed a shapeless mass which is retained in the bone. It may be so but, judging from similar conditions which I have seen in other animals, and they are very rare, the mass of hard tissue formed is not tissue which approaches to the structure of the normal tooth.

I have had another good look at the specimen you sent to the Museum and have discussed the tooth with some of my friends and we still think that it is not an aborted tooth but is the remnants of the formative parts of a tusk which was once in position. If you can prove that elephants which shed one tusk as calves develop really well-developed tusks then you have something to support your contention. I had a long talk to Major Powell-Cotton, a Big Game hunter and collector, and who has seen plenty of elephant life in Africa. I put the question of the frequency of tusks with severe fractures in a longitudinal direction and he remarked that such conditions were to be expected when one realised the way in which the African elephant used the tusks for breaking trunks of trees etc.

I see that the "erosion" of the female tusk does occur in the animal from the wild state. The case described by Sclater in 1871 was from a wild animal. If you do obtain another mass from a single tusker and will send it to me I will have it cut in two, examined and returned to you.'

Extract of my reply dated 29th October 1935.

'In your letter you put forward two or three queries, and you expressed the opinion that the tusk in many Indian elephants seems to be a degenerate organ, which would certainly seem to be the case as quite a number of male elephants fail to develop tusks and in Ceylon of course tuskers are uncommon. It is my view that many elephants which have only one developed tusk

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were possibly born with only one tusk, or when their "milk tushes", as it were, were shed they were replaced by only one instead of a pair of tusks. I had some correspondence on the matter with Mr. Gordon Hundley of Steel Brothers & Co., and one of the Bombay Burma Trading Corporation men. Both these Companies maintain, as you no doubt know, a large number of elephants, several thousand in fact. Gordon Hundley informed me that calves have been known which developed into single tuskers and referred me to Evans's work on *Elephants and their Diseases*. He also told me an interesting thing; that ivory thieves used to steal whole tusks from a living tusker by repeated blows on the point; after a certain period the tusk so maltreated can be removed or is shed. Also that one type of tusker will "cut through" a large tusk in a comparatively short time by continually "knocking" a trunkful of grass against one of his tusks.

Evans in his *Elephants and their Diseases* records a case where an elephant dropped a male calf which grew up with only one tusk. He also states that Selous recorded it as far from uncommon to meet with one-tusked animals among elephant cows in South Africa, though rarer among the bulls; and when an elephant has only one tusk the bone on the other side is quite solid and shows no sign of a hollow where the hollow ought to be. This has exactly been my experience, and you will recollect my informing you of this myself in regard to Indian single tuskers. Evans goes on to say that "Males occasionally lose a tusk when fighting or through other injury but some are born with a single tusk". Evans disagrees with Sanderson in the latter's statement that the first tushes of a bull elephant are never shed and says that on the contrary the milk tusks are shed between one and two years of age and replaced by the permanent ones.

If I do obtain another mass from a single tusker I will certainly send it to you.

Evans in his classical work on elephants mentions instances of mucknas (tuskless males) being feared even by powerful tuskers. This of course is well known among the jungle tribes both in India and Burma; mucknas seem to make up in size of body and trunk for the lack of tusks and are generally enormously powerful elephants. In fights between mucknas and even large tuskers as often as not the tusker will be defeated. Evans quotes a case of a fight between a good-sized tusker and a large muckna which was well known in the Shweli forests of Burma. During the course of the battle the muckna snapped off one of the tusks of its opponent with its trunk. A somewhat similar instance is recorded of a fight between a muckna and a tusker in which the former was seen to seize and break off one of the tusks of its antagonist.

HONNAMETTI ESTATE,
ATTIKAN P.O., *via* MYSORE,
S. INDIA.

R. C. MORRIS.

October 29, 1935.

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X.—HORN GROWTH AS OBSERVED IN BLACK-BUCK AND NILGAI.

I have always been under the impression that horns, by which is meant the outer horny covering of hollow-horned animals, grew without any break from early age to death in all species of *Bovidae*, e.g. Bison, Buffalo, Black-buck, Chinkara, Nilgai, Four-Horned Antelope etc. This at least is what I have read in most books dealing with Natural History, the solitary exception to the rule being the Prong-horn Buck of America; which annually sheds its outer horny covering of the bony core. Within the last two years however, four cases have come under my direct observation of partial shedding of outer horns, one case of Black-buck and three of Nilgai.

In the case of the Black-buck this is a perfect example of new growth of horns displacing the older horn from underneath and growing in the usual way. The buck when shot was noted as being immature, but carrying an exceptional head for his size. On examination this was found to be due to the lower and inner pair of horns having forced out an older and outer pair, which however had not been shed, but were still joined to the new pair. The joint is quite firm, the older pair of horns are splintered slightly at their junction through the forcing action of the new horn growth, thereby showing how the annular ridges of the lower horn fit perfectly with those of the outer horn. No doubt in the course of time by fighting, or otherwise, the older horns would have dropped off. This buck was shot in the Philibit District. The length of horns by straight measurement are right 21 in., left 21 in.; rather exceptional for the district where the average is 17-19 in. The outer horn-covering measures 16½ in. right and 15¾ in. left. Both horns are in my possession, though unfortunately the skull was cut down to form a small frontlet; my not being a very keen or expert field observer in those days. I kept the head out of curiosity and as something out of the usual.

In the case of Nilgai (Blue-Bull) which are fairly common in these parts (Behar), on two occasions I have noticed horns of old bulls covered with a sleeve of horny substance, evidently part of an outer horn casing in the process of shedding, such shedding taking place gradually by wear and not by the dropping of the entire outer casing. In my latest case however, I noted the horns of an old bull much splintered along their length, with indications that there were perfectly formed horns beneath the damaged covering. I took some pains about cleaning this head and now have a horn (right) showing very clearly how the outer covering is separated and shed from the newer growth; such shedding taking place along the entire length, and most probably assisted by the animal rubbing his horns against trees, bushes, etc. Length of right horn 8½ in. The left horn was unfortunately freed of the old covering by my servant, who misunderstood my instructions.

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In view of the above-noted observations of mine I would be glad to know if any other sportsmen or naturalists have recorded similar cases.

BURMA-SHELL CO., LTD.,
MUZUFFERPORE, BENGAL. J. E. HALL.
October 1935.

XI.—EARLY DEVELOPMENT OF ANTLERS BY SAMBHUR IN THE BILLIGIRIRANGAN HILLS, SOUTH INDIA.

There is an astounding number of sambhur on the Billigirirangan Hills, Kollegal and North Coimbatore Divisions, this year including many fine stags.

There are two interesting features in connection with the present increase in the number of sambhur, and here I may say that chital and bison have also appeared to have increased correspondingly. Many of the sambhur stags were in hard horn this year in August, which to my knowledge has not happened before within the past twenty years. By the end of the current month the remainder should be out of velvet. Further the sambhur seem to be unusually fearless this year. Time and again a group will trot off quietly on being approached and will then recommence grazing about 300 yards away. It is to be hoped that this is one of the first fruits of stricter game preservation, but I can hardly think this can be the case as yet. It would be extremely interesting to learn what actually governs the early or late shedding of antlers and growth into hard horn again, and what has caused stags to be in hard horn two months early this year. The increase in the number of large heads is remarkable.

HONNAMETTI ESTATE,
ATTIKAN P.O., *via* MYSORE, R. C. MORRIS.
S. INDIA.
September 6, 1935.

XII.—WHITE BISON.

Mr. Morris asks where White Bison are to be found in the Central Provinces. The answer is the Mandla-Balaghat jungles and their associates and the Chanda District. This list is not prescriptive, it is only what I know of.

As Mr. Morris does not agree with me in thinking that 'dormouse colour' and 'sandy or light fawn' are interchangeable colours, I would be grateful to know in what terms he would describe 'dormouse colour'.

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I take exception to Mr. Morris's remark that I admit in *Wild Animals in Central India* to not having much experience of Bison. Disparagement is generally evidence of a poor case. Such an admission on my part is a sheer impossibility, as I have lived amongst Bison throughout most of my service. As you, Mr. Editor, have given publicity to Mr. Morris's remarks, I would request an equal publicity to any quotation he can make, from anything ever written by me, which supports his statement, or as an alternative a complete and adequate withdrawal by him.

BISHOPMILL,
ELGIN, SCOTLAND.
January 6, 1936.

A. A. DUNBAR BRANDER,
I.F.S. (*Retd.*).

XIII.—MATING HABITS OF CROWS

With reference to the Miscellaneous Note xii (Mating Habits of Mynas and Crows), p. 186 of vol. xxxviii, No. 1, I may say that I have seen crows coupling twice in the normal manner of birds, in the afternoon at quiet spots where the pairs were by themselves on both occasions. I remember the incident because because one sees it so very rarely and because of a belief amongst the people of this part of the country, that such a sight foretells one's death within the next six months and, though one has no faith in such beliefs, it made me remember the incidents.

There is also a belief that crows hold a sort of council of their community—a lot of them are seen gathered together in a partial circle with one crow in the middle who is being chastised by two or three crows. The one so pecked at, receives his punishment meekly without any retaliation. The supposition is that the crow has committed some offence against the Crow-community and is so receiving his punishment quietly. I have seen such gatherings also. The Mynahs also have such small gatherings to witness the duels which occur then.

ICHALKARANJI.
September 5, 1935.

NARAYAN RAO BABASAHEB,
Chief of Ichalkaranji.

XIV.—EXTENSION OF THE RANGE OF THE WHITE-BROWED BULBUL (*PYCNONOTUS LUTEOLUS* LESS.).

The limit of distribution in the extreme east or rather north-east, of *Pycnonotus luteolus* Less. is given as Midnapur in the *Fauna* volumes. Mention of this is also made in Mr. Stuart Baker's *Nidification*, i, 398. Evidently this description is based on Tickell's original record (*J.A.S.B.*, ii, 573) from a 'woody and barren country at Bamireah, near Mednapur'. Blyth noted three specimens procured in 1847 in Midnapur jungles (*Cat. B. Mus. A.S.B.*, 210). So far as Western Bengal is concerned these

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appear to be the only records available. Mr. Whistler, though he writes of this bird (*Handbook of Indian Birds*, 1935, 65) as common in Western Bengal, is silent as to whether it is found anywhere else than Midnapur. It is of interest to note that in my excursion to Satgachia (20 miles east of Burdwan town), district Burdwan on June 23, 1935, I came across this species affecting the scrub-jungles on and near the bank of the river Banka. I collected one specimen alive with the aid of a bird-catcher. I also found it rather common and fairly numerous in the neighbouring thickets and unfrequented orchards on the Kalna Road, where I collected a second specimen.

Measurements:

No. 1. Apparently ♀ adult. Iris reddish brown. Bill somewhat slender. Wing 89 mm., tail about 88 mm., tarsus 23 mm., culmen 16 mm.

No. 2. Juvenile in moult. Iris brown. Bill stout. Wing 86 mm., tail 87 mm., tarsus 23 mm., culmen 16 mm.

By nature these birds do not appear to be as bold as their congeners, *Molpastes h. bengalensis* Blyth. and *Otocompsa e. emeria* (Linn.), with which they were sometimes observed to consort together. Skulking and evasive, they try to avoid detection as much as possible and, only when uttering their lusty warbles, serve to reveal their identity either in high tree-tops or low bushes. It is possible to spot them by their call, but it is difficult to get a good view of them.

There is no doubt the species is distributed beyond its recorded limit, still further north-east. The locality where the first specimen was secured is obviously typical of its haunt in a scrub and bush country. Hedges and thickets stretch along to some distance but are not very dense. The neighbourhood where the second specimen was collected harbours numerous orchards and garden-lands (Burdwan Raj's Staging Bungalow is among them) mostly in disuse, with an array of prickly undergrowth and secondary jungle. Here towards evening I saw quite a number of these birds, often going about in pairs. On my approach they would slip out of view and seek cover in lofty trees, wherefrom they would pour forth their voluble notes.

Ecologically the whole of this locality has no doubt much in common with the deltaic alluvium of Central Bengal, nevertheless its proximity to the more open, undulating and arid zone characterising a large section of the district does not altogether leave it impervious to its influences. Inasmuch as it is traversed by the Banka, originally a spill channel of the Damodar, which brings down vast quantities of silt from the Chota-Nagpur plateau, the action of this river has apparently not been inconsiderable in bringing about a gradual transfusion of the soil peculiarly favourable to the growth of scrub and bush jungle.

50, Kailas Bose Street,
Calcutta.
October 22, 1935.

S. C. LAW, M.A., Ph.D.,
F.Z.S., M.B.O.U.

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XV.—FURTHER REPORT ON THE NESTING OF *GEOCICHLA C. CITRINA* LATH. IN 24-PARGANAS (BENGAL).

I had on two previous occasions (*J.B.N.H.S.*, xxxvi, 501-2; *Ibis*, twelfth series, i, 778) recorded my observations on the nesting of *Geocichla c. citrina* Lath. in the district of 24-Parganas. I have now to report further instances which came to my notice:

July 2, 1935. Two young secured near Dum Dum from a nest in a mango tree.

July 10, 1935. A clutch of four fledgelings, also another clutch of two young: locally procured by a bird-catcher and brought for sale to the bird fair on the occasion of the Car Festival.

July 14, 1935. Nest with two young found in a bamboo clump in a place called Kerati near Dum Dum Aerodrome. One young ♀ still thriving in my aviary.

August 28, 1935. A nest found near Dum Dum Aerodrome with two young just hatched out.

It appears that protracted drought and exceptional weather conditions due to belated monsoon prolonged the period of nesting.

50, KAILAS BOSE STREET,
CALCUTTA.
October 22, 1935.

S. C. LAW, M.A., PH.D.,
F.Z.S., M.B.O.U.

XVI.—THE DISTRIBUTION OF THE KASHMIR ROLLER (*CORACIAS GARRULA SEMENOWI* LOUDON & TSCHUSI).

In October 1935, Br. A. Navarro, S.J., of the St. Xavier's College Museum, obtained two specimens of the Kashmir Roller (*Coracias garrula semenowi*) at Khandalla. As the *New Fauna* limits this bird to an area in North and North-Western India, the following records of its occurrence in Peninsular India may be of interest.

Davidson (*J.B.N.H.S.*, xii, 43) records a single specimen from Majoli, 5 miles north of Karwar, in November 1893. In the Bombay Natural History Society collection there are two skins obtained by T. R. Bell at Karwar in October 1898.

At a meeting of the Society held on 24th April 1900, E. H. Aitken mentioned the *European Roller* as one of the birds 'not usually found in or near Bombay, which had appeared that year, owing no doubt to the want of water and food in Guzerat and the Deccan' (*J.B.N.H.S.*, xiii, 398).

These records seem to show that the Kashmir Roller is a more or less regular visitor to the south along the line of the Western Ghats. In the field this bird may be distinguished from the Indian Roller or Blue-jay (*C. benghalensis*) by the absence of the large brown patch on the upper breast.

GODREJ HOUSE,
ANDHERI.
November 29, 1935.

H. ABDUL ALI.

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XVII.—HABITS OF THE PLAINTIVE CUCKOO (*CACOMANTIS MERULINUS* SCOP.).

I have recently had the opportunity of observing the bird described by Jerdon as the Indian Plaintive Cuckoo, at a place just below Kasauli, height about 5,000 ft. above sea-level. I saw a single bird several times, with the usual grey plumage. It was not at all shy, and I was able to see it at close quarters with field-glasses and to hear the typical call.

Yesterday evening I saw the bird with what I took to be its mate. This was bright rufous, with the abdomen barred, exactly as described by Jerdon as the adult in rufous plumage. What interested me was the fact that for the most part the rufous bird remained perched on the branch of a tree, whilst the grey one foraged for caterpillars, which it then brought and presented to the other, which ate them with relish.

Can you tell me whether it is a common event for a bird to feed its mate in this way? The rufous bird can scarcely have been one of the progeny of the gray one, for surely a cuckoo does not feed its own young.

Since writing the above I have come across an article by E. C. Stuart Baker in your *Journal*, vol. xvii, p. 83, in which he quotes Capt. Hutton's remarks regarding the Himalayan Cuckoo, *C. optatus* (Oates' *Nests and Eggs*, ii, p. 381):—'I have seen the young cuckoo sitting for hours together on a branch waiting for the return of the adult which continued every now and then to bring supplies of caterpillars wherewith to satisfy the apparently insatiable appetite of the nestling until at last both would fly off to another spot.' This exactly describes what I saw, but I think there is no doubt that the bird I saw was the Indian Plaintive Cuckoo.

PASTEUR INSTITUTE OF INDIA,
KASAULI, PUNJAB.
July 11, 1935.

G. COVELL,
Lt.-Col., I.M.S.

XVIII.—THE SHORT-EARED OWL [*ASIO FLAMMEUS* (PONTOPP.)] OUT AT SEA.

On the 19th October this year while on board the s.s. *Vita*, on my return journey from Cutch I noticed a bird, soon followed by two others, approaching the ship from the west. The ship was then about four hours' journey from Bombay Harbour. The flight of the birds was owl-like; but it was not until they came near that I was able to be sure. Finally one of them settled on the rigging quite close to me and it proved to be the Short-eared Owl (*A. flammeus*). The birds followed the ship for about an hour, at

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times flying high above the ship, at others just skimming the water's surface, in the same manner as do gulls. After this they went east towards the land which was just visible.

These birds were evidently on migration, as it is well known that the Short-eared Owl visits India during the winter months.

BOMBAY NATURAL HISTORY SOCIETY,
BOMBAY.
October 23, 1935.

C. McCANN.

XIX.—VULTURES FEEDING AT NIGHT.

I noticed on p. 190 of vol. xxxviii of the *Journal* a note by Mr. R. C. Morris on vultures feeding at night.

In case it is of any interest, I had an identical experience in 1921 when sitting up over a kill for a tiger near Neemuch. In my case, however, the vultures were disturbed before they could entirely demolish the kill.

MACHINE GUN SCHOOL,
AHMEDNAGAR.
September 18, 1935.

W. GOUGH.

XX.—PROBABLE BREEDING OF THE BLACK-WINGED STILT (*HIMANTOPUS H. HIMANTOPUS* LINN.) IN THE SHWEBO DISTRICT, UPPER BURMA.

In vol. xxxv, No. 1, of the *Journal* (June 15, 1931), I mentioned having found a small colony of Stilts obviously breeding two miles east of Kinu in the Shwebo district in July 1931 on a bog of volcanic origin, which is locally called a 'soap-bog'.

I had no opportunity to revisit this place until August 4th, 1935, when I flushed a single bird out of the rushy grass on the edge of the bog which was very loath to leave the place and almost certainly had young ones in the grass. The main part of this bog, about ten acres, is quite impassable, and the only other birds frequenting it were *Charadrius dubius jerdoni* and some Temminck's Stints.

The only other breeding records of this bird from Burma are from Myingyan in June and July 1900-1901 (*J.B.N.H.S.*, xvii, p. 499).

MYITKYINA,
UPPER BURMA.
August 6, 1935.

J. K. STANFORD,
Indian Civil Service.

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XXI.—THE JACK SNIPE AND THE WHITE-EYED POCHARD IN HYDERABAD.

The Hyderabad State Ornithological Survey did not come across the Jack Snipe (*Lymnocryptes minima*) and the White-eyed Pochard (*Nyroca rufa*). Major R. H. Stable, 3/6th Rajputana Rifles, whose game register for the seasons 1928-1930 is filed at the Society's office, shot jack snipe at Secunderabad as follows:

Season 1928-1929. 7 jack between 16th October and 22nd February, out of a total of 181 snipe.

Season 1929-1930. 33 jack between 9th October and 15th February, out of a total of 408 snipe.

In Stuart Baker's *Ducks*, Mr. P. M. Allen is recorded to have shot a pair of White-eyes in the Nizam's territory at Nalgonda, latitude 17°22′.

GODREJ HOUSE,
ANDHERI. H. ABDUL ALI.
November 29, 1935.

XXII.—SOME RARE BIRDS IN NORTHERN BURMA.

The records which follow are from the Myitkyina district. These skins have been sent to Dr. C. B. Ticehurst, whose notes are in square brackets.

Suthora unicolor. Brown Suthora.

There do not appear to be any Indian records of this Crow-Tit since the first edition of the *Fauna* was published. There are certainly none from Burma.

Mr. W. Stubbs shot a female on December 29th, 1934, on the Pajao-Nahpaw road, which winds round the western edge of Lungrebum (8,528 ft., Sheet 92, Survey of India). Lungrebum is at the extreme east-south-eastern corner of the Myitkyina district, and forms here the Myitkyina-Yunnan border. A few miles to the south-west, the Myitkyina and Bhamo districts meet at Nabang. I examined this bird a few minutes after it was shot and it was apparently with a flock of seven or eight others feeding in stunted cane jungle (which is a feature of this area), on a treeless hillside at about 7,000 ft. It had a most distinct white ring round the eye, a character not noted in the *Fauna*, and I recorded the soft parts at the time as: *iris* pale yellowish white, *bill* pale horny yellow, *legs* and *claws* plumbeous-green. I shot specimens of *Pseudominia castaneiceps* and *Fulvetta manipurensis* in this locality, on the same day but had no other opportunity to visit these hills.

[This specimen, as might be expected, belongs to the Yunnan-Szechuan form *canaster* described from Washan, Szechuan, by Thayer and Bangs and of which *saturatior* of Rothschild from the Shweli-Salween Divide is said to be a synonym. Mr. Stanford's bird matches Yunnan examples in the British Museum. *Suthora unicolor canaster* is a new form to the avifauna of British India.]

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Pomatorhinus ferruginosus. Coral-billed Scimitar Babbler.

The *Fauna* (Edition II) does not record any race of this Babbler as occurring between the Chin Hills and Yamethin, in Central Burma. In December 1933, I had a close view of a Scimitar Babbler with a vermilion or coral-red beak and a white supercilium at about 3,000 ft. in bamboo jungle near Sumprabum. In May 1934 Mr. W. Stubbs obtained a female at Kambaiti on the Yunnan border (7,000 ft.). In December 1934 I saw two or three, and shot a male on the Sadon-Sima frontier road at between 5,000 ft. and 7,000 ft. These were all with flocks of *Actinodura egertoni* in bamboo and tree jungle and, unlike the latter, were extremely shy, giving only momentary glimpses of themselves and uttering a repeated 'churring' note. When seen, the supercilium and bill were most distinctive characters in the field.

[This Scimitar Babbler belonged to no known form of *ferruginosus* and therefore I described it as new under the name *Pomatorhinus ferruginosus stanfordi* (Bull. B.O.C., lv, p. 178, June 1935).

At the same time I feel doubtful if *P. f. mariae* from the Karen Hills is different to *P. f. albigularis* from North Tenasserim but only fresh material from these two localities can decide the question.]

MYITKYINA.
June 1935.

J. K. STANFORD,
Indian Civil Service.

XXIII.—NOTES ON ELWES' HORNED PHEASANT (*CROSSOPTILON HARMANI* ELWES).

Location.—Near Nyengo, Tibet, about half way up the Gokar La Pass. Altitude 14,000 ft. Latitude 29°25′N. Longitude 91°33′E. Date 21st August 1935.

Type of country.—Steep-sided mountain, thickly covered with several types of dense prickly bushes, stunted silver birch trees, herbs and grass from which large rocks protruded in abundance. Country very difficult to move over.

Habits noticed.—A covey of 7 adult and young birds was first seen sitting on a rock. They were conspicuous by their red legs and feet. When this covey was flushed a number of other Crossoptilon started 'clucking' and showed this particular part of the mountain side to be swarming with them. It was not difficult to approach them to within 40 yards. When flushed they flew down hill. Amongst those seen were a number of young birds somewhat resembling black partridge both in colour and size.

The adults appear to have two distinct cries—one a 'Cluck' of alarm with a rather metallic resonance, and the other a communication call resembling the 'come-back' of the domestic guinea fowl. The young birds' call is a kind of shrill whistling cry very similar to that of the Marmot.

POLITICAL DEPARTMENT,
LHASA.
September 12, 1935.

R. K. M. BATTYE,
Captain.

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XXIV.—MIGRATION OF WILDFOWL.

(*Continued from volume* xxxvii, *page* 738).

Since the publication of the last recoveries of ringed birds, the following recoveries have been reported to us:—

Place of Ringing	No.	Date	Species	Ringed by	Date of recovery	Locality	Remarks.
Indore State.	720	12- 2-29	Coot (*Fulica atra*)	Conservator of Forests, Indore	March 1929	Near Station Veliko-Alexeevskaya, Trans-Siberian Railway, Province Tashkent.	
Kashgar, Chinese Turkestan.	2973	27- 1-29	Mallard (*Anas platyrhyncha*)	Capt. G. Sherriff	1-5-35	Village Lukovka, Pankrushicha, Region Kamensky, W.Siberia.	
Khadi Lake, Sujawal Taluka, Karachi Dist.	3953	18- 1-30	Pochard (*Nyroca rufa* 2)	Meher Aly Shah	April 1233	Village Solo-Tumba Kazak, Autonomous Republic 44° 34′ N., 66° 7′ E.	
Manchar Lake, ca. 26 °N × 68E. Shewan Taluka, Sind.	1271	21- 3-30	Shoveller (*Spatulaclypeata*)	K. G. Advani	25-5-30	Bolshië Tochty, Barabinsk Dist., Siberia.	
Purnia Tank, Dhar State.	82	14- 2-29	Common Teal (*Nettion creca* juv.)	Ahmed Nur	31-3-35	Village Novo Pokrovskoe, region Kantovski, 14 km. off the town of Frunse (formerly Peshpek) about 42° 26′ N., 74° 15′ E.	
Jhajja, Bahawalpur State. ca. 29 °N. × 72E.	2128	11-12-28	Dun Bird (*Nyroca ferina*) ♂	G. Atkinson	15-5-30	Bolshië, Tochty, Dist., Barabinsk, Siberia.	

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Since the commencement of the Society's Bird Banding Scheme approximately 4,000 rings have been issued to members and others interested in the migration of wildfowl. So far 26 birds have been recovered of which 13 were recovered in India either in the same year as they were ringed or on return from their breeding rounds. The remaining 13 were reported to have been captured or shot outside Indian limits, chiefly in Siberia.

Owing to the absence of properly organised Bird Banding Stations in India the ringing of wildfowl has been confined to ducks in places where they are regularly snared or shot.

BOMBAY NATURAL HISTORY SOCIETY,
BOMBAY. EDITORS.
January 1936.

XXV.—DO BIRDS EMPLOY ANTS TO RID THEMSELVES OF ECTOPARASITES?

In the course of our collaboration in the account of the birds of Bombay and Salsette (to be published in this *Journal*) my cousin Humayun Abdulali recently sent me the following note on Jerdon's Chloropsis [*Chloropsis jerdoni* (Blyth)].

'On 8 September 1934 I observed a pair catch and eat Red Ants (*Oecophylla smaragdina*) on a mango branch. The ants were captured in the beak and then quickly but deliberately rubbed into the tail feathers before being swallowed. Every ant captured was scrupulously treated in this peculiar fashion.'

He speculates that the ant is crushed and the sac-like abdomen bursts in the process discharging formic acid 'which may be absorbed by the fluffy tail-coverts' (?)

As far as I am aware, a similar observation has not been made in India before and Abdulali deserves credit for *recording* what most people would have considered far too trivial or 'original' to bother about. The instance only shows—if an example were needed—how much there is still to be learnt by an unprejudiced study of the *live* bird.

Referring to literature, it is interesting to find that the same question as heads this note was put forward by Dr. E. Stresemann in the *Ornithologische Monatsberichte* for July-August 1935 (p. 114). He pointed out that the expected discussion had not been produced by the publication of H. Heine's note in *Orn. Monatsb.* in 1929 (p. 188) under the title 'Crows use Ants to get rid of Ectoparasites', but that he had now, for the first time, found quite similar observations recorded in the recent book by A. H. Chisholm, *Bird Wonders of Australia* (Sydney, 1935), pp. 153-5.

In the note referred to, Heine had observed some Hooded Crows (*Corvus cornix*) deliberately seeking an ant-hill of *Formica rufa* and squirting or allowing themselves to be squirted with formic acid in order, the author presumed, to rid themselves of ectoparasites. Mr. Chisholm in his book, describes European Starlings (*Sturnus vulgaris*) introduced into Australia, taking ants in their bills and sticking them deliberately under their wings, and also suggests that the object of this behaviour was to expel or kill

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the ectoparasites by means of the formic acid exuded by the squashed insects.

A number of very interesting notes on similar observations from readers of *Ornithologische Monatsberichte* followed the above communication by Dr. Stresemann, and these are published in the September-October issue of that *Journal* (pp. 134-8). Aggregately they indicate that without doubt this habit is widely and regularly practised by many species of birds, especially of the tropics.

Kleinschmidt refers to a short communication published in a sporting paper as far back as 1911, of a tame Magpie (*Pica pica*) eagerly seeking all available cigar stumps and rubbing them into its plumage. *Apropos* of this note, Dr. Heinroth observed at the time that Starlings do something similar with live ants and that a young Dipper (*Cinclus cinclus*) was seen by himself and his wife to catch the insects in the tip of its bill and rub them deliberately through its wing feathers. The ant was then dropped, a fresh one seized and the action was repeated on the feathers of the abdomen and thighs. It would be assumed, naturally enough, that the bird did so to get rid of vermin, but Dr. Heinroth further remarked that several young dippers taken by him from the nest and who could not have had a similar experience before, acted in precisely the same manner although no trace of any parasites could be detected on them, a fact which suggests that the reaction is wholly instinctive.

Other writers also recorded similar observations with crows and starlings, of these birds not only sticking the insects into their feathers, but literally 'bathing' in a swarm of ants. Herr Neunzig observed that caged *Leiothrix* and several species of *Garrulax* will even stick mealworms into their plumage. From this, Dr. Kleinschmidt speculates that it may perhaps be the pleasant sensation produced by insects crawling through their plumage—akin to that produced by stroking a bird's nape with the fingers, which it so obviously enjoys—that induces birds to behave in this manner.

One correspondent mentions that his tame Carrion Crow (*Corvus corone*) 'bathes' as often as it can in ant swarms with much apparent relish, one such bath lasting for 25 minutes! The bird gathers a number of ants in its bill, squashes them, rubs them through its plumage and then casts them away in the form of a pellet and gathers more. The same observations have been made with captive *Chloropsis* species and with the thrushes *Turdus musicus* and *T. philomelos*.

A. Troschütz is quoted as writing in *Gefiederte Welt* (1931, p. 484) as follows: A peculiarity which only some exotic birds (*Leiothrix lutea*, *Lioptila capistrata*, etc.) and the Thrushes have in common is their predilection for ants, not as food but for rubbing into their thighs, rump and wings. The formic acid has probably some beneficial effect, but whether it helps to eradicate parasites or acts as some form of general tonic is doubtful. In the case of his tame crow, at any rate, Herr Troschütz doubts if it can be the former, since the bird takes plenty of water baths and keeps itself scrupulously clean.

The notes published deal in all with the following species of

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birds, both captive and in a wild state: Magpie (*Pica pica*), Jay (*Garrulus glandarius*), Starling (*Sturnus vulgaris*), the crows *Corvus corone* and *C. cornix*, *Leiothrix lutea*, *Lioptila capistrata*, *Garrulax* spp., *Chloropsis* spp., the thrushes *Turdus musicus* and *T. philomelos* and the Dipper (*Cinclus cinclus*).

Besides ants, which are regularly and deliberately rubbed through the plumage by all of them, there are other things which have also been observed to be similarly utilised. Cigar ends and mealworms have been mentioned before, and 'Flohkrebs' (?) and many acid fluids such as lemon-juice and vinegar are among the others.

Formic acid—first discovered by Rey in 1670 by distilling red ants (*Formica rufa*)—is well known to be a powerful antiseptic, and ants rubbed into the feathers of a bird would indeed effectively rid them of noxious insects as has been generally suggested. Mealworms and 'Flohkrebs' (evidently some sort of caterpillars?) require closer investigation, although it is known that formic acid is also formed in the acid secretions of certain caterpillars.

Tobacco-juice or decoction is commonly sprayed by gardeners to ward off insect pests and is also widely and effectively used by jungle people to deter leeches from climbing up their legs and for dropping off partly satiated ones. Moreover, it is common knowledge that a slice of lemon rubbed on to the arms, neck etc. will discourage bites of mosquitoes and sandflies (*Culicidae* and *Psychodidae*) and it seems very probable that lemon-juice (*citric acid*) may have a similarly repellent action on lice (*Mallophaga*), ticks and other ectoparasites of birds. It is not difficult to conceive, therefore, that in the above cases, the cigar-ends, lemon-juice, vinegar etc. may all have been instinctively employed by the birds for this purpose although the immediate need was not apparent.

As Dr. Stresemann points out in his summing up, however, the assumption that the ridding of parasites is the real object of this behaviour is merely a conjecture so far, albeit a very plausible one. It is hoped that this note will provoke further observation and experiment.

Curiously enough in none of the observations referred to is there a suggestion that the ants were *eaten* by the birds at the time or after being rubbed through the feathers, and in this Humayun Abdulali's note differs from the rest. Ants in varying degree form the food of so many bird species in India that there is nothing remarkable about this part of his observation, but the effect of formic acid taken internally is of some interest. Taken by mouth or hypodermically, it is said to give tone to the muscles, increase muscular energy and abolish the sense of fatigue.[1] The Stinging Nettle (*Urtica dioica*) which also contains formic acid, has long been employed as a tonic and diuretic, and it may be for this and the other beneficial properties that red ants are eaten by the Santāls, a typical Dravidian tribe of Chōta Nāgpūr.[2]

[1] Martindale and Westcott, *The Extra Pharmacopeia*, 19th edition, 1928, vol. i, p. 34.

[2] Sir George Watts, *Dictionary of Economic Products of India*, vol. i, p. 264.

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In addition to formic acid, ants also contain a small amount of formaldehyde and at a certain stage these may be chemically acted upon by the gastric secretions of the bird and converted into glucose which is a very valuable food material. It is conceivable also that at times the formic acid from the squashed and swallowed ant may have the effect of ejecting endoparasites with which we know birds are commonly afflicted.

Dr. Stresemann suggests the use of a special term for this 'rubbing in' process on a par with preening which may be translated into English, and henceforth used, as 'anting',—e.g. a bird ants itself or its feathers, even when objects other than ants (necotine, lemon-juice, mealworms etc.) are used in the process.

DEHRA DUN. SÁLIM ALI.
November 11, 1935.

XXVI.—GECKOS AND SUPERSTITION.

Many reptiles have given rise to superstitious notions the world over, and lizards have also made their contribution in this direction. Having been engaged in the preparation of a detailed memoir on the common Indian wall-lizard (*Hemidactylus flaviviridis* Rüppel) for the last two years, I have been much interested in the prevalent superstitions about geckos. Some of the results of my search are given below.

Flower[1] says, '"Bors", or "Abu Bors", is, as it was in the time of Forskaal, the common name for any Gecko in Egypt. Better-informed people may tell you that it is "Abu Boris", to fit better with the words used by Damiri, "Abou Baris" (Jayakar's translation, *1*, p. 352) and "Sâm Abras" (o.c. *2*, p. 23), meaning respectively "Father of leprosy" and "Poison of a leper." Damiri wrote: "One of the characteristic qualities of this animal is that, when it settles down in salt, it rolls about in it, giving rise to what becomes the means of producing white leprosy."

'It should be mentioned that some of the desert Arabs, who know more about lizards than the Fellaheen do, include under the term "Bors" the Red-spotted Lizard *Eremias rubropunctata*: I do not know why. They believe in poisonous and non-poisonous lizards: a non-poisonous lizard may be known by its running fast for a short distance and then stopping suddenly—for it has remembered it has no poison!'

The bite of house-geckos is generally, though erroneously, regarded as poisonous and Roberts[2] describes ten native remedies for it. Even the saliva[3] of these creatures is believed by some people to be highly emetic. According to an article in *Encyclo-*

[1] Flower, S. S., 'Notes on the Recent Reptiles and Amphibians of Egypt, with a list of the Species recorded from that Kingdom.' (*Proc. Zool. Soc.*, 1933, pp. 742-3.)

[2] Roberts, E., 'Native Remedies used in Snake-Bites, etc.' (H. W. Cave & Co., Colombo, 1919, pp. 41-3.)

[3] Prof. N. M. Antani, St. John's College, Agra, tells me that the dropping of a house-lizard's saliva in milk is believed by the people of Gujarat to make the latter highly poisonous.

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paedia Britannica,[1] the saliva is supposed 'to produce painful cutaneous eruptions'; and even the touch of geckos 'was thought sufficient to convey a dangerous taint'. In almost all places in India, the touch of a house-lizard is believed to be polluting in effect and there are people who attribute this reptile to the pariah or 'sweeper' caste.

The following explanation[2] of this popular disfavour sounds plausible: 'With the head considerably flattened, the body short and thick, the legs not high enough to prevent the body from dragging somewhat on the ground, the eyes large and almost destitute of eyelids, and the tail short and in some cases nearly as thick as the body, the geckos altogether lack the litheness and grace characteristic of most lizards. Their colours also are dull, and to the weird and forbidding aspect thus produced the general prejudice against these creatures in the countries where they occur, which has led to their being classed with toads[3] and snakes, is no doubt to be attributed.'

In India, both the sound produced by a house-gecko and its falling on the human body are supposed to be predictive in nature. Several Indian almanacks give accounts of the consequences to be expected if a lizard produces sound from this or that direction, or happens to fall on a particular part of the body. The following quotation[4] is an example:

'If the house-gecko (*Tiktiki*) makes a sound from above, acquisition of money is expected; from the east, immense success; from the south-east, fear; from the south, fear of fire; from the south-west, quarrel; from the west, profit; from the north-west, fine clothes and scented water; from the north, gain of goddess-limbed woman; and from the north-east, death. The same consequences can be expected from sneezing.

'If the house-lizard falls on the right side of the body, there will be loss of relatives and money. On the left side, profit. On chest, forehead, back and throat, gain of kingdom. On arms, legs and heart, happiness.'

Tamil almanacks,[5] however, are far more detailed in this respect. In them, the consequences to be expected from a

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[1] 'Gecko' (*Encycl. Brit.*, 11th. ed., 1911, xi, pp. 546-7).

[2] *Op. cit.*, same pages.

[3] Cf. Shakespeare's *Macbeth*, IV, i, ll. 12-19:

'Fillet of a fenny snake,
In the caldron boil and bake;
Eye of newt and toe of frog,
Wool of bat and tongue of dog,
Adder's fork and blind-worm's sting,
Lizard's leg and howlet's wing,
For a charm of powerful trouble,
Like a hell-broth boil and bubble.'

[4] From *Gupta Press Directory Panjika* (Bengali), 1935-36, p. 41 (published by Gupta Press, Calcutta). The passage was translated by Mr. J. C. Banerjee, to whom I am thankful for it.

[5] I have consulted *Anand Bodhini*, 1933, edited by C. G. Rajan, B.A. Mr. C. S. Krishnamurti who kindly translated the necessary passages for me, tells me that exactly the same sort of thing is mentioned in other Tamil almanacks also and that there is no change in this portion from year to year.

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gecko's sound depend not only on the direction from which the sound is produced, but also vary from day to day in the week. The parts of the body on which the lizard may fall are mentioned in great detail, and the consequences also appear to be better discriminated. The list consists of as many as forty-five anatomical regions.

Why is the gecko's sound regarded as prophetic? Here is an interesting explanation:[1]

'The God Boar cut off the tongue of Khona Saheb and stood guarding it in a secret place. The lizard came, thought that it was an article of food and devoured it. Since then, the sound of a house-lizard can bring the facts of past and future to light.' Obviously, Khona Saheb was a great prophet himself!

One should like to know, however, why the fall of the house-lizard on the human body comes to have predictive value. Perhaps some member of the Bombay Natural History Society can enlighten us on this point!

St. John's College,
Agra. B. C. MAHENDRA.
August 20, 1935.

XXVII.—THE NOTODONTID MOTH *DUDUSA NOBILIS* WALKER.

In vol. xxxviii, No. 1, Mr. T. R. Bell gives an interesting account of the early stages of the above moth.

It might interest Mr. Bell and other members of the Society to know that I have a pair of these moths in my collection and which were caught in the house which to my mind proves they 'are attracted by artificial light'. I mention this as Mr. Bell says they are certainly not.

This moth is fairly common in Upper Burma as I have seen many on the wing but only cared to collect a pair. If I have an opportunity to collect others I shall be glad to send Mr. Bell a specimen or two for comparison with his own bred ones.

Unfortunately I did not at the time record the date of capture.

Maymyo, W. C. CARROTT,
Burma. *Captain.*
September 4, 1935.

XXVIII.—OCCURRENCE OF *UNKANA ATTINA* IN THE TEESTA VALLEY.

When collecting in the Teesta Valley below Kalimpong (Darjeeling District), I captured a ♂ *Unkana attina* on 8th September 1934, flying at about 1,000 ft. in shady jungle. I identified it by Brigadier-General Evans' *Identification of Indian Butterflies*, and was surprised to see that it had hitherto apparently not been taken further north than Bassein.

[1] *Gupta Press Directory Panjika*, 1935-36, p. 76.

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Recently I had the good fortune to be able to show it to Brigadier-General Evans in the South Kensington Museum, who confirmed my identification, and added that my specimen was distinctly darker than any of the series in the Museum, which show a progressive darkening towards the north. This seems to indicate that this butterfly may be found sparingly throughout the intermediate region and have an alternative to its normal food-plant, the cocoa-nut palm, which is not found in the Kalimpong district.

On the other hand as the district has been so extensively worked by collectors, and the butterfly itself is so large and distinctive, consideration must be given to the possibility that it may have been accidentally imported in the pupal stage in a crate of cocoa-nuts.

South Kensington,
London, S.W.
July 20, 1935.

JOHN ELIOT,
Lieutenant, R.A.

XXIX.—ON THE PRESERVATION OF *HETEROCERA* IN INDIA.

Collectors of Butterflies are far more numerous in India than those of Moths, the reasons usually advanced being that the *Heterocera* are more difficult to identify and preserve.

The first of these reasons has a certain foundation, the only general books that are easily obtainable being Hampson's Moths in the *Fauna of British India* and the three Indo-Australian volumes in Seitz's *Macrolepidoptera of the World*. Hampson is now out of date and incomplete and Seitz, which is still in course of publication, does not include the *Pyralidae*.

The excuse regarding preservation, however, is completely unfounded and the following account of how I deal with my specimens may be of help to other collectors. In the first place I must make it clear that I set nothing in India, all my specimens being papered and sent to Europe.

After killing the moth with cyanide, I paper it in exactly the same way as I would a butterfly, the envelope bearing the usual data in pencil. I keep the papered specimens in a large cigaratte drying bottle, the drying pad being exchanged for a wad of cotton soaked in creosote as a preventive against mildew. I never eviscerate even the largest species and, except for an occasional specimen becoming greasy, I have never had the slightest trouble. As soon as I have accumulated a couple of hundred insects, I pack them securely and post them to London, where they may remain for two or three years before being relaxed and set.

For relaxing I use methylated spirit. The papers and their contents are damped with the spirit and are then shut up in an air-tight tin for a couple of days. The insects will then be perfectly pliable and ready for setting and can be removed from the setting boards after twenty-four hours. Hairy-bodied species should not be damped, as this leads to the matting of the hair on the thorax and abdomen, but should be exposed to the fumes of a mixture of spirit and water. It is important to write all data

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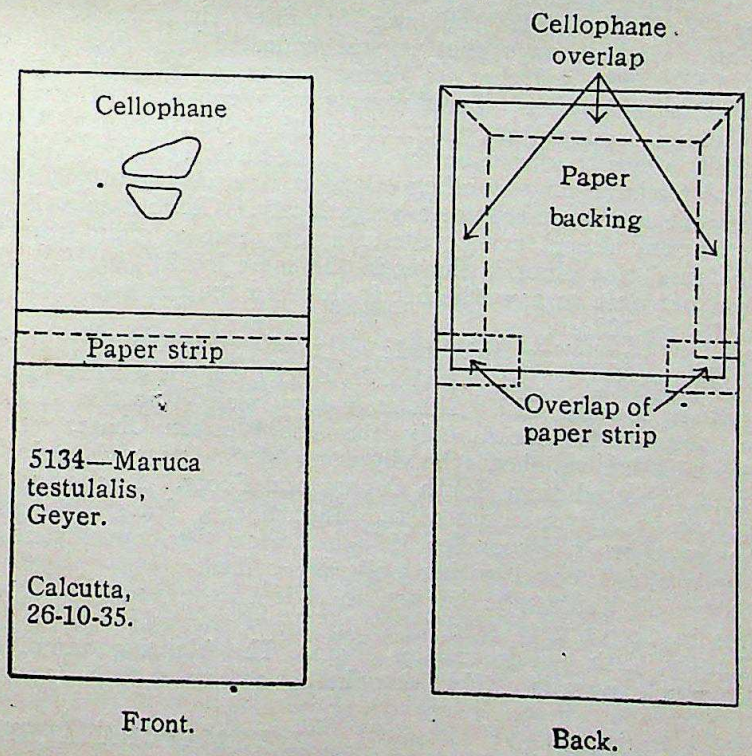
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on the envelopes in ordinary lead pencil; ink or copying pencil is affected by the spirit and will cause stains on the insects inside the papers. I have employed this method with great success on the largest *Saturniidae* and the smallest *Pyralidae*.

For reference in India, I keep a series of wings mounted on cards. These are prepared as follows:

Take a suitable piece of card, I use small visiting cards, and cut a piece of Cellophane large enough to cover from a third to a half of the card, depending on the size of the wings to be mounted, and to overlap each side and the end. The two wings of one side are then cut off as close to the base as possible, a thin film of good paste such as Gripfix is brushed over the card, the wings are placed in position and the whole covered with the Cellophane and pressed down. The overlaps are turned over and pasted to the back of the card, a thin strip of paper is pasted over the free edge of the Cellophane to prevent it coming away from the card and a small square of paper is pasted over the back of the mount to prevent it warping with changes in humidity. The usual data is written on the exposed half of the card. I have found it convenient for comparison to make all mounts with wings from the same side, either right or left is immaterial. If the markings of the underside are of importance, a wing can be mounted to show this aspect also.

The appearance of the finished mount is shown below.



Papered specimens are very difficult to examine and I have

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found these mounts extremely useful in two ways. They enable local variation to be recognised at once and also serve as a basis when identifying one of a group of allied species, especially those where Hampson's description reads 'As . . . but lines more oblique.'

CALCUTTA. D. G. SEVASTOPULO, F.R.E.S.

October 28, 1935.

XXX.—ON THE FLOWERING OF *STROBILANTHES* IN 1934.

Very little has been known about the periodical flowering of the numerous species of the genus *Strobilanthes* and M. E. Robinson's record of the flowering of a few of them in 1934 in No. 1, vol. xxxviii of the *Journal,* is a useful contribution. As I travelled through Coorg, Wynaad and Nilgiris in September 1934 I am able to add the following species which were found flowering in addition to those mentioned by M. E. Robinson.

S. heyneanus Nees, was found in flower in jungles in Coorg and Wynaad. Gamble says it is often found in flower.

S. cuspidatus T. And. was found on the sides of hills in Gudalur. Gamble says that it was collected in flower in 1851, 1870, 1877, 1884 and that its period seems to be about 7 years.

S. sessilis Nees, was flowering very copiously all over the hills behind Naduvattam overlooking the Ouchterloney Valley. This hill is locally known as the Gudalur malai as it overlooks the town of Gudalur on the other side. It is a very pretty plant in flower and grows and flowers gregariously. Gamble says it probably flowers almost every year or at any rate at short intervals. I also found this plant in flower in the same locality in May 1933, but am not able to say whether it flowered profusely in that year as it did in 1934.

Before concluding this note I might mention that I found *S. consanguineus* C. B. Clarke, in bloom on the sacred hills of Tirupati in March 1927. This is a new locality for this plant as it has been so far known only from the Western Ghats.

Little is known about the flowering of *S. warrensis* Dalz. It has been reported from South Canara and Coorg. I collected this species on the lower slopes of the High Range, Travancore, above Neriamangalam in December 1933 but then the flowering season was over and I could gather only dry spikes.

Lovers of plants who happen to collect any species of *Strobilanthes* in flower may send them to the writer who will be glad to identify their specimens for them. The planting community can do much towards establishing the periodicity of their flowering.

BOTANY DEPARTMENT, P. V. MAYURANATHAN.
GOVERNMENT MUSEUM, MADRAS.

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PROCEEDINGS OF THE ANNUAL MEETING OF THE BOMBAY NATURAL HISTORY SOCIETY.

The Annual General Meeting of the Society was held at the Prince of Wales' Museum on Monday the 9th March 1936 at 6-15 p.m. The Hon'ble Mr. Justice K. W. Barlee, I.C.S., was in the chair.

AGENDA.

1. Reading of the Annual Report of the Committee.
2. Presentation of the Balance Sheet and Statement of Accounts for the past year.
3. Election of the Committee.

Mr. P. M. D. Sanderson, Honorary Secretary, announced the election of the following thirty new members since the last meeting:

Mr. A. N. Moos, Bombay; Lt.-Col. J. D. Deane-Drummond, Nilgiris; Mr. B. E. Smythies, B.F.S., Rangoon; Mr. P. G. Chapman, Burma; Major J. H. L. Hindmarsh, Delhi; Mrs. M. Parker, Bandra; Mr. F. J. Mustill, I.F.S.; The Librarian, Imperial Secretariat Library, New Delhi; Mr. E. Jenning, Upper Burma; Mr. G. P. Walden, Upper Burma; Mr. L. J. Vernall, Upper Burma; The Honorary Secretary, Rangoon Literary Society, Rangoon; Major D. A. Tapp, Belgaum; Mr. J. E. Gardiner, Bombay; Capt. J. M. Ferguson, Deccan; Mr. K. D. Kothawala, Ahmedabad; Mr. E. J. H. Jacobson, Calcutta; Mr. F. C. Badhwar, Calcutta; Mr. Noel Exshaw, France; Mr. E. J. Langleson, Bombay; Mr. H. E. Burgess, Nilgiris; Mr. Mg Tun Yin, B.A., Rangoon; The Economic Botanist, Bengal; Mr. M. R. Gokaru, Kalyan; Mr. D. Willis Fleming, Assam; Miss Winifred H. Baker, Lahore; Rev. M. G. Champion, Roorkee; Capt. G. McElligot, M.R.C.V.S., Bombay; Mr. U. B. H. Dunbar, Burma; and Mr. Jal N. D. Tata, Bombay.

The following proposals were accepted:—

Vice-President.—Rev. Fr. J. F. Caius, S.J., in place of the late Rev. Fr. E. Blatter, S.J.

Executive Committee.—Mr. H. D. Ash, in place of Major S. L. Bhatia, I.M.S., who does not attend meetings.

Advisory Committee.—Two names to be struck off the roll, i.e. Lt.-Col. F. C. Fraser, I.M.S., and Lt.-Col. C. H. Stockley, D.S.O., who have left India.

BOMBAY NATURAL HISTORY SOCIETY.

Office Bearers—1936.

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Vice-Patrons.—H. H. The Maharao of Kutch, G.C.S.I., G.C.I.E.; H. H. The Maharaja of Jodhpur, K.C.S.I., K.C.V.O.; H. H. The Maharaja of Rewa, K.C.S.I.; H. H. The Maharaja of Bhavnagar; H. H. The Maharaja of Travancore; Mr. F. V. Evans, Liverpool; Sir David Ezra, Kt., F.Z.S., Calcutta; Mr. A. S. Vernay, New York and London; Lt.-Col. K. G. Gharpurey, I.M.S. (Retd.).

President.—H. E. The Right Hon'ble Lord Brabourne, G.C.I.E., M.C.

Vice-Presidents.—H. H. The Maharao of Kutch, G.C.S.I., G.C.I.E.; The Hon'ble Sir Robert Bell, K.C.S.I., C.I.E., I.C.S.; Rev. Fr. J. F. Caius, S.J.

Executive Committee.—Right Revd. R. D. Acland, Bishop of Bombay, Mr. H. D. Ash, Mr. Farrokh E. Bharucha, Mr. C. B. B. Clee, I.C.S., Sir Alwyn Ezra, Kt., F.R.G.S., F.Z.S., Mr. J. B. Greaves, M.L.C., Lt.-Col. S. S. Sokhey, I.M.S., Mr. A. Forrington (*Honorary Treasurer*), Mr. H. McGusty, Mr. P. M. D. Sanderson, F.Z.S. (*Honorary Secretary*), Bombay.

Advisory Committee.—Dr. C. F. C. Beeson, D.Sc., M.A., I.F.S., Dehra Dun; Mr. T. R. Bell, C.I.E., I.F.S. (Retd.), Europe; Lt.-Col. R. W. Burton, I.A. (Retd.), Coonoor; Mr. C. H. Donald, F.Z.S., Dharmsala; Dr. F. H. Gravely, D.Sc., Madras; Mr. S. F. Hopwood, I.F.S., Rangoon; Mr. C. M. Inglis, M.B.O.U., F.Z.S., Darjeeling; Mr. R. C. Morris, F.R.G.S., F.Z.S., Coimbatore;

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Major E. G. Phythian Adams, F.Z.S., I.A. (Retd.), Nilgiris; Dr. Baini Prashad, D.Sc., Calcutta; Mr. H. C. Smith, I.F.S., Maymyo; Mr. J. H. Williams, Coimbatore.

ANNUAL REPORT OF THE BOMBAY NATURAL HISTORY SOCIETY. FOR THE YEAR ENDING 31ST DECEMBER 1935.

ADMINISTRATION.

President.—H. E. The Right Hon'ble Lord Brabourne, G.C.I.E., M.C.

Vice-Presidents.—H. H. The Maharao of Kutch, G.C.S.I., G.C.I.E.; The Hon'ble Sir Robert Bell, K.C.S.I., C.I.E., I.C.S.

Executive Committee.—Right Revd. R. D. Acland, Bishop of Bombay, Mr Farrokh E. Bharucha, Major S. L. Bhatia, I.M.S., Rev. Fr. J. F. Caius, S.J., Mr. C. B. B. Clee, I.C.S., Mr. Alwyn Ezra, F.R.G.S., F.Z.S., Mr. J. B. Greaves, M.L.C., Mr. H. McGusty, Mr. J. G. Ridland, Lt.-Col. S. S. Sokhey, I.M.S., Mr. A. Forrington (*Honorary Treasurer*), Mr. P. M. D. Sanderson, F.Z.S. (*Honorary Secretary*), Bombay.

Advisory Committee.—Dr. C. F. C. Beeson, D.Sc., M.A., I.F.S., Dehra Dun; Mr. T. R. Bell, C.I.E., I.F.S. (Retd.), Karwar; Lt.-Col. R. W. Burton, I.A. (Retd.), Coonoor; Mr. C. H. Donald, F.Z.S., Dharmsala; Lt.-Col. F. C. Fraser, I.M.S., Coimbatore; Dr. F. H. Gravely, D.Sc., Madras; Mr. S. F. Hopwood, I.F.S., Rangoon; Mr. C. M. Inglis, B.E., M.B.O.U., F.Z.S., Darjeeling; Mr. R. C. Morris, F.R.G.S., F.Z.S., Coimbatore; Major E. G. Phythian Adams, F.Z.S., I.A. (Retd.), Nilgiris; Dr. Baini Prashad, D.Sc., Calcutta; Mr. H. C. Smith, I.F.S., Burma; Lt.-Col. C. H. Stockley, O.B.E., D.S.O., M.C., Meerut; Mr. J. H. Williams, Coimbatore.

Staff.—S. H. Prater, M.L.C., J.P., C.M.Z.S. (Curator); C. McCann, F.L.S. (*Assistant Curator*).

THE HONORARY SECRETARY'S REPORT FOR THE YEAR 1935.

THE SOCIETY'S JOURNAL.

The Thirty-seventh Volume of the *Journal* was completed and two parts of Volume XXXVIII were issued during the year.

Birds:—

Survey of Eastern Ghats.—The more important scientific papers published during the year include the reports on various Ornithological Surveys. Messrs. Kinnear and Whistler continued their reports on the Vernay Scientific Survey of the Eastern Ghats, parts X, XI and XII of which were published. The authors deal with the Parrots, Bee-eaters, Kingfishers, Hornbills, Swifts, Nightjars, Owls and Vultures which occur in the Madras Presidency, and comment on their status and distribution.

Travancore and Cochin.—Parts I, II and III of the Ornithology of Travancore were published during the year. The papers are based on a Survey of the States of Travancore and Cochin, carried out by the author Mr. Salim A. Ali in 1933. Since the publication of Hume's and Ferguson's papers on the birds of Travancore a considerable advance has been made in our knowledge of the avifauna of the Peninsula of India notably through the recent surveys in the Eastern Ghats and Hyderabad State. The Survey of Cochin and Travancore was specially undertaken to link up with the surveys in neighbouring areas and so complete the data available. In his Introduction, the author makes a special plea for greater concentration on the study of birds in relation to their environment. Every student with an observant eye and an enquiring mind can make some contribution. A great many biological problems await solution by the intensive study of animal life in its environment, and such study can now be recommended to bird lovers in India. It is recommended as being of far greater importance and potentiality than the mere collection and labelling of skins.

Sittang Irrawaddy Plain.—In Volume XXXVII, No. 4, we published Mr. Stanford's note on the Birds of the Sittang Irrawady Plain. Since Oates published his *Birds of British Burma* in 1883, practically no one has collected in the huge area which lies between the mouth of Sittang on the East and the hills which fringe the western side of the Prome, Henzada and the Bassein

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Districts. Mr. Stanford's collections in this area were identified by Dr. Ticehurst who contributed his notes to the paper which lists 291 species, 3 of which are new to Burma.

Central Provinces.—Mr. E. A. D'Abreu, Curator of the Nagpur Museum, published a paper on the Birds of the Central Provinces, based on collections and observations carried out over a period of 20 years. His paper is a revision of his list published in 1923 to which many alterations and additions have become necessary.

Chittagong.—A paper on the Birds of Chittagong was written by Capt. R. S. P. Bates based on observations made during a period of three months, March-May 1934. Capt. Bates also contributed a paper on the Nesting Habits Habits of Some Indian Birds illustrated with the fine photographs which usually accompany his articles.

Fishes.—Fishes of Afghanistan.—In 1933 we published a paper by Dr. Sunder Lal Hora on the Fishes of Afghanistan. During the year under review we were able to publish a second paper by the same author on the fishes of this little known area. The paper is based on a collection made by Sir Richard Maconachie, Major A. E. Farwell and Capt. E. W. Fletcher. The thanks of the Society are due to these gentlemen for their very valuable collection, the study of which has helped us to a better knowledge of the precise specific limits of McClelland's hitherto ill-defined species from this country. In Volume XXXVII, No. 4, Mr. John Berry, of the Natural History Department, University College, Dundee, described an interesting case of semi-cyclopia in a shark (*Charcharias dussumieri*). The monstrosity was obtained by the Raffles Museum, Singapore.

Snakes.—Dr. S. G. Tscherbakoff wrote a paper on the feeding of cobras in captivity based on observations of 319 specimens kept in the Serpentarium of the Haffkine Institute, Bombay. Various experiments were conducted relative to the method of feeding and housing of cobras in captivity. The results will be conducive to reducing the high rate of mortality among these snakes for whose venom there is an increasing demand from medical research workers.

Col. K. G. Gharpurey, I.M.S., contributed a paper on the Snakes of Belgaum which supplemented his previous note on the snakes of this area.

Insects.—Part III of Mr. Martin Mosely's paper on Indian Caddis Flies was published during the year. The series of articles when complete will form the standard work on Indian Trichoptera. Articles on Butterflies included Major Ghosh's paper on the Butterflies of Nepal, based mainly on 3 months collecting in the Nepal Valley. The paper provides a nucleus on which a complete list of the Butterflies of this unknown region may be built up. Col. Logan Homé wrote on the Butterflies of Secunderabad and its surroundings, and listed 70 species obtained within this area. The Butterflies of the Nilgiri District, a popular area among collectors, were listed in a paper by Mr. J. A. Yates. The author revises and supplements Sir George Hampson's List published in the *Journal of the Royal Asiatic Society* in 1888. Lt.-Col. F. C. Fraser described a new Drangonfly from Burma; and Mr. T. R. Bell the Notodontid Moth (*Dudusa nobilis*) and its early stages. Mr. Mathew's interesting paper on the life history of the Plant Bug (*R. pedestris*) traces the development of the species and shows how in the early stages the nymphs exhibit close resemblances to different species of ants. The ant-mimicking is gradually lost in the subsequent moults and disappears completely in the adult. The Californian Red Scale Insect (*C. auranti*), a serious pest of citrus plants in many parts of the world, is recorded by Mr. P. M. Glover as attacking Grape Fruit grafts recently imported into India, the attack was not very heavy but of sufficient intensity to warrant control measures. In the same paper Mr. Glover records an instance of the Lac Insect as a pest of Grape Fruit. A resin spray was found effective in the control of both these coccids.

Botanical papers include 'The Revision of the Flora of the Bombay Presidency'. Parts XXVI and XXVII were published during the year. The authors, the late Rev. Fr. Blatter and C. McCann, deal in these parts with the Cyperaceae.

The Medicinal and Poisonous Plants of India are being described by Rev. Fr. Caius. During the year the author dealt with 3 Orders—the Palms, the Ferns and the Sedges and gave data of the medicinal and poisonous properties

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perties of the species mentioned. Father Caius also wrote a very interesting and readable monograph on the Papaya or Papaw Tree with notes on its cultivation, food value, medicinal uses and commercial possibilities. Mr. Robinson gives an account of the flowering of Strobilanthes on the hills of South India in 1934. Among the species referred to is *Strobilanthes Kunthianus* 'the great blue flower' of the Nilgiris which once in 12 years colours whole tracts of the hill sides with sheets of delicate blue. The author illustrates the article with fine pen and ink drawings of 7 species.

Popular Papers.—Among the popular papers published during the year was Mr. Stuart Baker's concluding article on Waders and Semi-Sporting Birds. The series which commenced in Volume XXXI, No. 2, will form a companion volume to his work on the Game Birds of the Indian Empire, 3 volumes of which have already been published by the Society. The thanks of the Society are due to the author whose writings, for so many years, have added much to the attractiveness of the *Journal*. Mr. Stuart Baker's recently published work on the *Nidification of Indin Birds* (4 volumes, Taylor & Francis, London) will be found of great interest to all bird lovers and students in this country. It replaces Hume's *Nests and Eggs of Indian Birds* which was till now the standard work on the subject. Members will be interested to know that Stuart Baker has now in preparation a book on Cuckoos—a fascinating subject on which he wrote a series of articles in the early volumes of the *Journal*, and which Col. Burton recently summarised in his paper on 'Cuckoo Lore'.

Parts XVII, XVIII and XIX of the serial on Beautiful Indian Trees were published during the year. Twenty-eight of our more conspicuous flowering trees have so far been described and illustrated in colour. It is proposed during 1936 to complete the series with description of 3 more species. The Committee have decided to issue this attractively illustrated serial in book form. Orders may now be registered for the book. The estimated cost to members is Rs. 9.

As usual the *Journal* contained a number of shikar articles. Notable among these was Vicomte Edmond de Poncins' Reminiscences of a 'Hunting Trip in the Sunderbunds' in 1892, Mr. Burgess' account of his 'Early Days in Malaya' and Mr. W. S. Thom's 'Experiences of hunting Rhinoceros in Burma'. In the rigid conditions of our day these records of veteran sportsmen who hunted and travelled in the more spacious times of the past make interesting reading.

There can be few places more likely to appeal to a lover of nature than a secluded Salt lick in some remote forest of Burma. Mr. Peacock describes his attempts to photograph Tsaine in these surroundings and illustrates his account with some fine production of his camera. Speaking of Salt licks brings us to the analytical investigation carried out for the Society by Rev. Fr. Caius into the composition of Salt licks. Samples of earth from 39 different salt licks have so far been chemically analysed by Fr. Caius and the results published. During the year, in response to enquiries and as a guide to those who wish to co-operate in the work, the author published an account of the procedure adopted by him in his analysis. Col. R. W. Burton, a very welcome contributor to the *Journal*, published an account of his visit to the Yala Game Sanctuary in Ceylon. The author has visited many sanctuaries in India and Burma but nowhere has he seen so much varied wild life in its natural state as in the Yala Sanctuary. For 36 years the animals in this sanctuary have multiplied in peaceful security; but, without the allotment by the Government of Ceylon of funds for providing increased grazing and water the animals in the sanctuary must inevitably suffer.

During the year the Society published Parts III and IV of the serial on the Wild Animals of the Indian Empire. The parts deal with the Beasts of Prey and cover the Cats and the Civets. In conformity with the previous parts, the serial is beautifully and profusely illustrated with numerous photographs and coloured plates. Once again the Society has to offer its thanks to Mr. F. V. Evans, whose continued generosity has made possible the publication of these articles. As a pendant to the serial we published articles by various authors on the problem of protecting wild animals in various parts of India and Burma. Those who contributed were H. C. Smith (Burma); R. D. Richmond and R. C. Morris (the Madras Presidency); Salim A. Ali (Hyderabad); Major Phythian Adams (Mysore).

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In conclusion we should like to offer our thanks to the numerous members who contributed to the Miscellaneous Notes which make an important and very readable feature of the *Journal*. We should like to develop this section of the Journal and to print more articles of a popular nature so as to make our publication still more attractive to the general reader. We hope that members will continue to send us their observations and experiences which are often very valuable and always make interesting reading.

The Museum.—The new Natural History Wing of the Museum was completed during the year and the transfer of the collection to the new building was started in December. The work involves the breaking down of several of the large habitat groups, which were so much admired in the old wing. They will be resurrected in a far finer setting in the new wing and a larger number of new groups will be built. During the year an expedition to the Runn of Cutch was organised to acquire material for the building of a group illustrating the nesting habits of the Flamingo. The thanks of the Society are due to His Highness the Maharao of Cutch and Prince Vijayarajji for their generosity in meeting the considerable expense involved. We are also indebted to Capt. Steer Webster who conducted the expedition under the most difficult climatic conditions. As a result, ample material was obtained for the construction of a group which will form a beautiful and striking addition to the Bird Gallery. Mr. S. F. Markham who is on a tour of inspection of Museums in India on behalf of the Museums Association, inspected the New Museum and expressed himself as very pleased with the designing, lay out of the galleries and with the methods of exhibition which were being adopted in the Natural History galleries. He stated that when completed the Natural History section would be the finest of its kind in the East.

Revenue Account.—This account unfortunately shows a loss again this year. The deficit for the last three years was as follows:—

Year.	Deficit.
1933	Rs. 2,451 8 9
1934	,, 4,847 8 9
1935	,, 5,655 12 0

Actual receipts this year were Rs. 26,847-7-11 as against the receipts of Rs. 30,050-7-7 in 1934, a decrease of Rs. 3,222-15-0.

This year's decrease in receipts is made up as follows:—

	1934.	1935.
Subscriptions ...	Rs. 22,810 7 2	Rs. 20,409 6 10
Entrance fees ...	,, 820 0 0	,, 640 0 0
Sale of Journals ...	,, 1,605 0 0	,, 1,268 11 0

Balance Sheet.—The Society's investments are shown as per the last Balance Sheet or at market value whichever is the lower.

Life Membership Fees.—In 1935 the Society received Rs. 700 on account of Life Membership fees. This has been taken to increase the reserve for Life Membership fees. This account now stands at Rs. 48,200. Under our memorandum of association we have to maintain investments in excess of the total of our Life Membership fees. The market value of our investments exceed this figure considerably, as will be seen from the Balance Sheet.

Membership.—During the year 1935, 66 new Members, including 2 Life Members, joined the Society, and 61 members resigned.

The total number of members on the roll of the Society (excluding 195 Life Members) was as follows:—

31st December 1934	970
31st December 1935	973

In spite of the slight increase in membership as compared with 1934, there was a decrease in Revenue from subscriptions. This is partly due to the fact that Messrs. Lloyds Bank, who usually pay the subscriptions of Members for the ensuing year in the month of December of the previous year, have not done so for the year 1936. Thus the year 1935 is short of Rs. 1,720 in subscriptions, which went into 1934. The total number of members who paid their subscriptions for 1935 was 848 as compared with 908 in 1934. This shows a decrease in subscriptions of 60 members.

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General.—The loss on last year was anticipated, and although the present financial position is sound, we cannot continue to work at a loss for very much longer. As will be seen from the Balance Sheet, we have surplus Assets made up from surplus revenue, etc., which form a Reserve Fund and although every economy possible has been effected for the coming year, it is most necessary to bring in new members. Any co-operation from present members in this respect would be greatly appreciated.

Staff.—The Committee wish to thank the Curator and his staff for the usual good work during the past year.

P. M. D. SANDERSON,
Honorary Secretary.

Mr. Prater then delivered a short lecture on the new Natural History Wing of the Prince of Wales' Museum and the plans for its development. Mr. Prater said that one of the main objects for which the Museum exists is popular education and entertainment, but 90 per cent of the visitors who came to the Museum came there purely for pleasure and so with the majority of visitors the message the Museum had to offer was lost, unless the Museum provided something to rouse their attention and hold their interest. The purpose of the Museum should be to lead people to better ideals and to offer them new points in a way which they could understand and appreciate. The appeal could be made more to the senses than to the intellect, but it could be made in such a manner that in addition to mere attractiveness it should offer food for thought, which was the first step to a higher and more intellectual ideal. There were many ways of telling the story of Nature. Their plan was to choose the beautiful way, the way which leads from an appreciation of its interest and beauty to an understanding of its meaning. We were living in a changing world, the stress and strain of modern life and the demand it makes on the time and attention of the wage-earner does not leave much time for intellectual pursuits or for such side issues as art or natural history. The democratic spirit of the age necessitated a change in the attitude of the Museums towards the public. The older Museums were autocratic, they were exclusive laboratories of science intended for scientists where the visiting public were looked upon as intruders. But modern conditions are bringing about a change in this policy. Museums are becoming more and more dependent on public support, on money voted by the people's representatives, and unless something was done for the people that support would not be forthcoming.

It has been more and more realised that if Museums which stand for the cultural development are to succeed in their mission it is necessary for them to alter their standards, to break down their aloofness and restraint—that attitude which looks upon the public as a nuisance—and to come down to a more sympathetic consideration of the people's wants. It is the duty of the Museum Curator to see that his Museum is worth being interested in, to give his Museum such vitality and pertinence that people will want to be interested in it, will want to visit it and will realise the advantage of supporting it.

Mr. Prater then proceeded to show what was being done in the new Natural History Wing of the Museum in furtherance of this policy, how the whole arrangement of the galleries, the show-cases and the exhibits were planned with a view to creating interest and rousing the attention of the layman. Suitable colour schemes were being adopted in the different galleries with a view to providing an attractive 'atmosphere'. The show-cases were being built and arranged to avoid that feeling of artificiality and cumbersomeness which makes so many over-crowded Museum galleries repellent. The arrangement of exhibits on shelves was being done away with to avoid monotony in arrangement. The exhibits themselves were carefully prepared and selected so as to give the visitor a clear outline of the animal kingdom without confusing him with too much detail. Specially interesting to the layman would be the large number of habitat groups with scenic backgrounds illustrating the various phases of animal life. These groups make a direct appeal to people by their beauty, the appreciation of which was common to

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all. Nevertheless, when well designed and constructed each of them had a lesson to teach. Apart from illustrating animal life the groups would also illustrate various phases of Indian scenery from the deserts of Sind to the evergreen forests of Assam and the snow-capped peaks of the Himalayas.

In conclusion Mr. Prater said that Mr. Markham who had recently visited the new wing of the Museum expressed himself as very highly pleased with the plans of development and the methods of exhibition now being used in the natural history wing which he said when completed would be easily the finest of its kind in the East.

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BOMBAY NATURAL HISTORY SOCIETY.

BALANCE SHEET AS AT 31st DECEMBER 1935.

LIABILITIES	Rs A P	Rs A P	ASSETS	Rs A P	Rs A P
Life Membership fees :		48,200 0 0	*Investments—At holding value or Market value on 31st December, 1935, whichever is lower :—*		
Donations for specific objects unexpended:			Rs. 35,000 3½% Loan 1947/50 at 102½% ...	35,787 8 0	
Show Cases, Models of Fish &c. in Prince of Wales' Museum—Account No. 1 ...	1,412 15 10		,, 15,000 5% do 1945-55 at par ...	15,000 0 0	
Show Cases &c. in New Building, Prince of Wales Museum—No. 2.	18,932 11 0		,, 10,000 3% do. 1951-54 at 98% ...	9,800 0 0	
Special Journal Fund	3,823 4 0		,, 14,000 4 Port Trust Bonds at 77% ...	10,780 0 0	
		24,168 14 10	,, 15,000 4 % Improvement Trust Bonds at 76%	11,400 0 0	
Sundry Creditors :			,, 5,700 Govt. 5½% Loan 1938-40 at par	5,700 0 0	
Printers of Journal	2,514 10 7		,, 500 ,, 5% ,, 1945-55 ,,	500 0 0	
For Expenses	250 0 0				88,967 8 0
		2,764 10 7	*Cash—*		
Surplus Assets :			With National Bank of India Ltd., Bombay	8,585 0 5	
Balance as per last Balance Sheet ...	30,008 13 2		With National Bank of India Ltd., London, £73-2-3 at 1/6	974 13 4	
Add -Profits on sales of Securities ...	7,238 12 0		On hand	150 0 0	
	37,247 9 2				9,709 13 9
Less—Loss on Revenue Account	5,705 12 0		*Sundry Debtors :*		1,229 6 0
		31,541 13 2	*Furniture :*		
			Balance as per last Balance Sheet	1,652 0 0	
			Less Depreciation	50 0 0	
					1,602 0 0
			Publications, excluding Journals :		
			As certified by Hon. Secretary	..	300 0 0
			Game Books, Vol. III :		
			Stock on hand as certified by the Hon. Secy.		705 9 0
			Bird Charts and Albums		
			Stock on hand as certified by the Hon. Secretary	...	1,563 10 3
			Bates' Bird Lite :		
			Stock on hand as certified by the Hon. Secretary	...	1,029 8 6
			Butterfly Book :		
			Stock on hand as certified by the Hon. Secretary	...	53 8 10
			Beautiful Indian Trees :		
			Stock on hand as certified by the Hon. Secretary	..	1,514 6 3
Total ...		1,06,675 6 7	Total ...		1,06,675 6 7

Note.—A stock of 20,400 old Journals and the Valuable Research Collection and Library of 2,600 volumes have not been taken into acconnt on the Asset side of the Balance Sheet.

We have prepared the above Balance Sheet from the cash book and from the information given to us, and have verified the investments.

In our opinion, such Balance Sheet represents a true and correct view of the state of the Society's affairs according to the best of our information and explanations given to us.

BOMBAY, *2nd March, 1936.*

(Sd.) A. F. FERGUSON & CO.,
Chartered Accountants, Auditors.

A. FORRINGTON,
Honorary Treasurer.

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BOMBAY NATURAL HISTORY SO

REVENUE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER 1935.

	Rs A P	Rs A P		Rs A P	Rs A P
To Salaries	16,188 8 3		By Subscriptions	20,409 6 10	
,, Society's Contribution to Staff Provident Fund	1,610 4 0		,, Entrance Fees	640 0 0	
,, General charges	613 7 5		,, Sales of Journals	1,268 11 0	
,, Rent	2,436 0 0		,, Interest on Investments	3,629 10 11	
,, Stationery and Printing	426 4 0		,, Sales of Game Books, Vols. I & II ...	569 0 0	
,, Postage	1,154 15 6		,, Society's small Publications	350 11 2	
,, Library	359 3 6				26,847 7 11
,, Audit Fee	250 0 0		,, Balance of Expenditure over Income ...		5,705 12 0
,, Insurance	100 0 0				
,, Depreciation on Furniture	50 0 0				
,, Loss on Taxidermy Department ...	60 9 3				
,, Cost of Printing Journals	9,304 0 0				
		32,553 3 11			
Total ...		32,553 3 11	Total ...		32,553 3 11

PUBLICATION ACCOUNT FOR THE YEAR ENDED 31st DECEMBER 1935.

	Rs A P	Rs A P		Rs A P	Rs A P
To Stock of Bird Charts and Albums (1-1-35)	3,691 14 3		By Sales of Bird Charts and Albums ...	3,121 0 0	
,, Expenses during the year (1-1-35) ...	992 12 0		,, Stock on hand (31st December, 1935) ...	1,563 10 3	4,684 10 3
		4,684 10 3			
,, Stock of Butterfly Books (1-1-35)		333 8 10	,, Sales of Butterfly Books ... ... ,, Stock on hand (31st December, 1935) ...	280 0 0 53 8 10	333 8 10
,, Stock of Game Books, Vol. III (1-1-35) ...		1,011 9 0	,, Sales of Game Books, Vol. III ... ... ,, Stock on hand (31st December, 1935) ...	306 0 0 705 9 0	1,011 9 0
,, Stock of Bates' Bird Life (1-1-35) ...		1,106 0 6	,, Sales of Bates' Bird Life ... ... ,, Stock on hand (31st December, 1935) ...	76 8 0 1,029 8 6	1,106 0 6
,, Stock of Beautiful Indian Trees (1-1-35)...		1,514 6 3	,, Beautiful Indian Trees Stock on hand (31st December, 1935)		1,514 6 3

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Dr. Cr.

INCOME AND EXPENDITURE ACCOUNT OF DONATIONS FOR SPECIFIC PURPOSES FOR THE YEAR ENDED 31st DECEMBER, 1935.

	Rs A P	Rs A P		Rs A P	Rs A P
Fund No. 1			By Unexpended Balance as per last Balance Sheet	2,402 7 4	
To Expenditure on Show Cases, etc. ...	2,689 7 6		,, Donations for the Modeller's Salary, etc.	1,700 0 0	
,, Balance carried to Balance Sheet ...	1,412 15 10				4,102 7 4
		4,102 7 4			
Show Cases Fund No. 2			,, Unexpended balance for Show Cases in New Building as per last Balance Sheet	17,784 9 0	
,, Expenditure on Show Cases in New Building	4,424 9 0		,, Interest During the year	572 11 0	
,, Balance carried to Balance Sheet ...	18,932 11 0		,, Donation during the year	5,000 0 0	
		23,357 4 0			23,357 4 0
Special Journal Fund			,, Balance as per last Balance Sheet in Special Journal Fund...	6,282 14 0	
,, Expenditure on Printing Plates, etc. ...	2,559 10 0		,, Donations received during the year ...	100 0 0	
,, Balance carried to Balance Sheet ...	3,823 4 0				6,382 14 0
		6,382 14 0			

BOMBAY, *2nd March, 1936.*

Examined and found correct.
(Sd.) A. F. FERGUSON & CO.
Chartered Accountants, Auditors.

(Sd.) A. FORRINGTON,
Honorary Treasurer.

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Members of the Expedition at Tumri Hka.
Left to right: R. C. Morris, A. S. Vernay, H. C. Raven, S. F. Hopwood.
Seated: C. McCann.

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JOURNAL
OF THE
Bombay Natural History Society.

Aug. 1936. Vol. XXXVIII. No. 4.

THE VERNAY-HOPWOOD UPPER CHINDWIN

SOME BEAUTIFUL INDIAN TREES.

The concluding article in this serial which will deal with the Padouk will appear in the next number of the *Journal*.—Eds.

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'Thus the seed was sown. From time to time we further discussed the possibilities of an expedition, and later I took up the matter with members of the scientific staff of the Museum. When I was informed that no animals from the Upper Chindwin country were in the collections of the Museum and that such specimens were greatly to be desired, the importance of the undertaking became apparent.

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F. Hopwood.

Journ., Bombay Nat. Hist. Soc.

Left to right: R

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THE VERNAY-HOPWOOD UPPER CHINDWIN EXPEDITION.

BY

R. C. Morris, f.z.s., f.r.g.s.

(*With 6 plates*).

As an introduction to an account of the Vernay-Hopwood Upper Chindwin Expedition of 1935 I cannot do better than quote Mr. Vernay's own words in the June Number of 'Natural History' (*the Journal of the American Museum of Natural History*).

'The plan to penetrate the Chindwin region of inner Burma grew out of a conversation that I had several years ago with Mr. S. F. Hopwood, Chief Conservator of Forests of Burma.

'At the time, we were collecting specimens in Lower Burma for the South Asiatic Hall of the American Museum of Natural History. Mr. Hopwood pointed out to me the exceptional rewards which this remote section would yield to a scientific expedition. The Chindwin River, or the "Mighty Chindwin" as he called it, wound through a country which in many parts was unknown, a region buried in dense jungle, unvisited by white men. Interest was added by the fact that a journey to this region would take one within the territory of the head-hunting Nagas.

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the "shikari" of Southern India; also Major Rowley, an experienced shikari and Mr. Charles McCann, Assistant Curator of the Bombay Natural History Society. And finally, a few months before the Expedition set out, Mr. H. C. Raven, Associate Curator of comparative and human anatomy at the American Museum, fortunately was able to join us. Mr. Hopwood accompanied the Expedition for a few weeks. The task of organizing fell chiefly to his lot, and the success of the Expedition is evidence of his thoroughness in these preparations.'

Mr. Vernay and Major Rowley arrived in Calcutta by the Imperial Airways Plane on the 4th January and we met at the Great Eastern Hotel. The Imperial Airways bus called for us at 4 a.m., and at 5-30 a.m. the plane left the Dum Dum Aerodrome for Rangoon. The route took us over the Sunderbans and then over the open sea until we sighted the coast of Burma at about 7-45 a.m. From the air the Sunderbans looked like a vast low-lying mass of swampy jungle cut up by numerous streams and channels. Landing at Akyab at 8-30 a.m. we breakfasted and left for Rangoon at 10 a.m. A squadron of Air Force planes took off for Rangoon and Singapore just ahead of us. Flying over the Arrakan Yomas we reached the Mingladon Aerodrome, Rangoon, at 12-45. Here we were met by Messrs. Hopwood and Raven. Mr. McCann of the Bombay Natural History Society had already preceded us to Nanyaseik, our first collecting point. Spending the next two days in Rangoon completing our outfit etc. we left by train for Mandalay on the 8th afternoon in a special self-contained Railway Officers' carriage. Arriving at Mandalay on the following morning we proceeded up the Irrawaddy river in a steam launch visiting the 'Great Bell' of Mingun, the world's largest or second largest bell, and the huge unfinished and ruined pagoda nearby. Detraining at Mogaung on the following morning we loaded our outfit on buses, including four cows and six goats for baits! and, after a tiring journey on an appalling road, arrived in the evening at Nanyaseik where Mr. J. K. Stanford, the District Commissioner of Myitkyina, and Mr. McCann, who had already been successful in collecting a number of specimens of mammals, met us.

An amusing incident occurred on the railway journey up to Mogaung from Mandalay. Hopwood's dog, we discovered, had been left behind at a wayside station soon after the train had started and the mail train was stopped to send back for it!

On the 11th and 12th all our stores and outfit were packed into 60 lb. loads for mules and we started collecting specimens, the mammals shot comprising squirrels, *Callosciurus sladeni*, *Tamiops*, *Tomeutes*, tree shrews and monkeys and quite a number of birds. McCann had already collected specimens of the above as well as of the Hoolock gibbon (*Hylobates hoolock*), two macaques and a male and female Barking Deer.

On January 13th 110 mules were loaded up and we left at 8 a.m. for Namting and Lonkhin (19½ miles). Including our interpreters, skinners, Burmese servants and the Yunnanese muleteers we were a party of fifty-eight. The skinners comprised

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Mr. Stubbs, kindly lent to us by Mr. Stanford, Mr. Fernandez of the Bombay Natural History Society, and Mr. Gabriel Joseph lent to the expedition by the writer. Each muleteer had five mules under his control and very efficiently handled the mules were. The two leading animals were adorned with brilliantly coloured plumes of dyed goat's hair and a mirror in the harness to keep off the evil spirits. I think I am correct in saying that the hire paid *per* mule *per* month was Rs. 16-8-0. The assistance of Mr. Stanford was most valuable. The path to Namting and Lonkhin led through hills and valleys covered with dense evergreen jungle, 750 ft. above sea level at Namting and rising to nearly 1,300 ft. a few miles from Lonkhin. Dropping down to Lonkhin we pitched camp round the Rest House, perched on a knoll (850 ft.) on the bank of the Uyu river. In the evening two members of the party accompanied Mr. Stanford out after woodcock and secured a couple. Dense morning mists were a feature of both Lonkhin and Nanyaseik. Maximum and minimum temperatures recorded by Mr. McCann at Nanyaseik were in the region of 76° and 50° respectively. We continued our collecting at Lonkhin and traps were put out every evening. Efforts to secure a specimen of the White-winged Wood Duck were unsuccessful. As at Nanyaseik, there were large numbers of Hoolock gibbons, their howling in the mornings resound through these jungles. Very human as these gibbons are, it was hateful work shooting them for the collection. The minimum temperature at Lonkhin went down to 44° while the maximum during the day rose to 82°F. A young civet, *Viverra zibetha*, was secured near the bungalow and the traps yielded rats and tree shrews. A visit was paid to the Kansi Duwar's house in the village where we saw the very fine pair of elephant-tusks portrayed on page 486 of the *Bombay Natural History Society Journal*, vol. xxxvii, No. 2. The Kansi Duwar, the ruler of the Kansi State, was instrumental in clearing for us many miles of paths through the jungle from Lonkhin to Dalu (Taro) on the Tanai Hka (upper reaches of the Chindwin river). Journeys at night in dugouts were made up-river with 'jacklights' on our heads for anything we could secure for the collection, three owls and a nightjar being secured. Shooting rapids in the dugouts on our way back was not without excitement. On the 17th most of the party left for the Hpakan Jade Mines. Photos of scenes in the bazaar and at the Jade Mines were taken and that night we spent an hour or so in the streets of Hpakan. Most interesting it all was, not excepting the gambling tables both in the houses and out in the streets, the opium dens and other features typical of mining towns and camps. We all slept the night in the Hpakan Rest House and on the following morning, Stanford accompanied us over the mines again and further photos were secured. The methods used for pumping water out of the workings were most ingenious, long hollowed-out bamboos, with a bamboo piston covered with soft leather, being employed most efficiently as pumps. Most of the workings were on the Uyu river here, and every stone in the vicinity had been at one time or another turned over and examined. The workings

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were in no case of great depth and apparently the labourers employed by the owners of these workings received only their food with a share of the profits of any find. These mines are of special interest in that they are the only true green Jade Mines in the world, nearly the entire output being exported to China. Jade stones of other colours were shown to us in the most beautiful shades of mauve, pink, orange and blue; but none of these are of any real value. White jade we were informed is mined on the Yunnan border, and a form of soft green jade in Tibet. After buying some jade in the rough we returned to Lonkhin (14 miles) where McCann had carried on the good work of collecting, his bag including a crab-eating mongoose (*Herpestes urva*).

The following morning saw us marching to Tawmaw, about 12 miles from Lonkhin at an elevation of 2,700 ft. where we camped. The path led through dense forest for most of the way ascending at times over crests of over 2,000 ft. Gibbons were in evidence on all sides, and langurs. A few of the latter were collected. At Tawmaw are a number of disused Jade Mines and the houses of their owners, some of which are in charge of watchmen. That night four specimens of civets (three of *Arctogalidia leucotes*, a female and two young, and one of *Viverricula malaccensis*) were secured by the party with the aid of jacklights. A total eclipse of the moon occurred lasting a considerable time. During the night the minimum temperature recorded was 42° and the maximum during the day 76° and on the following night the minimum temperature was 39°. The Kachins brought in a number of peacock-pheasants and partridges and the party secured five specimens of *Callosciurus* and some birds.

On the 21st we moved camp to Mansun, a 12-mile march. The path led over crests of 3,000 ft. and through dense forest the whole way. The camp at Mansun (elevation 3,200 ft.), where our tents were pitched near a long Kachin's hut, proved most productive. Perched on a ridge and surrounded by dense evergreen and bamboo forest, Mansun was a most picturesque spot. Blister flies were bad here. Traps were laid out daily. The temperatures recorded were from 42° to 45° during the night and 76° to 78° during the day. The dew was very heavy. A number of gibbons, squirrels and birds were collected including a young baby gibbon captured alive, which however died later. Kachins brought in a few pheasants, frogs, snakes, crabs, a tortoise and a live adult bamboo rat. A baby stump-tailed monkey (*Macaca*), which McCann had procured from the locals at Lonkhin died here. Tracks of tiger being in evidence a couple of baits were put out.

Just as we were leaving for our next camp news came in that a tiger had killed one of the baits. The kill was visited and a machan prepared. Vernay and Raven sat up that night but with no result. In the meantime the rest of the party proceeded to the next halt, Kora, passing through the Kachin village of Hpala. The Kachins are very neat in their water supply arrangements. Bamboo-pipes are installed in many places and wooden stands erected for bamboo water containers. The path to Kora dropped down to the upper reaches of the Uyu river (1,000 ft.)

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and rose steeply to Kora (2,600 ft.). We were met on the way by Kachin villagers who had already collected for us specimens of reptiles, mammals, birds and amphibians for which they were duly paid. Blister flies continued to be very bad and it was noticed that the legs and arms of the Kachin villagers were a mass of bites. The Kachins are most adept with their bows and clay pellets with which they shoot birds and squirrels. Specimens of silver and peacock-pheasants, partridges, squirrels, bamboo rats were brought in by the villagers on the 25th. A stump-tailed monkey was collected by a member of the party.

The Kachins like most jungle folk have a keen sense of humour and they appeared to derive great enjoyment from the frequent tosses members of the party took while collecting over the rough and tricky country.

Raven sat up over the kill at Mansun again that night but saw nothing of the tiger. Apparently a number of tiger are accounted for annually by trapping in Burma. One method is to plant bamboo stakes thickly on both sides and close up to a path frequented by tiger. The split half of a bamboo clapper, released by the tiger coming into contact with a cord tied across the path, springs back against the other half with a loud report and apparently causes the tiger to jump to one side and so impale itself on the bamboo stakes! The jungle around Kora is very dense, chiefly bamboo. Both here and in the Mansun and Tawmaw jungles a feature of the forest is the large number of a gigantic species of *Dipterocarpus* with a scaly bark. One of them had a girth of 24 ft. 7 in. with a clear trunk reaching 150 ft. up to the lowest branches. On the 26th, five specimens of the stump-tailed monkey, including a young, were secured, a very welcome addition to the collection. The digging out of a bamboo rat by Kachins was witnessed and proved most interesting. The Kachins brought in many specimens. On the following day three more stump-tailed monkeys were collected, also a giant squirrel. A large part of the area traversed was *taungya* (abandoned cultivation) and here a number of bison and sambhur tracks were in evidence and also those of pig.

The Kachins in these parts are neither good trackers nor tree-climbers and we often had great difficulty in keeping them from conversing in loud tones while out collecting.

Some fine specimens of *Lobelia* were in flower in the *taungya*.

The minimum temperature during the night was in the region of 50° to 51° and the maximum during the day about 74°.

On January 28th camp was moved to Pumsin, the path dropping down to 1,900 ft. from Kora to the Kum Hka and rising at the village of N'bung Hku to an elevation of 3,150 ft. From here the path ascended at Pumsin to 3,900 ft. Gibbons were collected and a young gibbon about a year old captured alive. The country round Pumsin is steep on all sides. The Kachins erect bamboo benches where their main paths top hills and ridges, a most convenient and thoughtful habit. Some of the Kachin women in the village of N'bung Hku wear large cylindrical pieces

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of amber in their ears. Violets were growing all round our camping ground at Pumsin and in the jungles round about, as also at Mansun and Kora, there are a large number of fish-tailed palms. One of them was cut down by the Chinese muleteers, which very nearly led to trouble with the Kachin villagers, as these palms are considered sacred. The Kachin headman demanded Rs. 30 in compensation but was eventually satisfied with Rs. 2! From our camp we had a wonderful view of vast chains of forest-covered hills, while away in the distance lay the Naga Hills, the region we were heading for. Our collection was being rapidly increased. Mammals, birds and reptiles were secured by the party and brought in daily by the Kachins, while Raven took plaster casts of the villagers' faces and feet. The forest was chiefly bamboo interspersed with patches of evergreen trees. A brush-tailed porcupine was brought in, and traps yielded tree shrews (*Tupaia*) and rats. The minimum temperature in the night was in the region of 50° and the maximum during the day was 80°. The Kachin headman of Pumsin, a villainous-looking individual bore on his face the scar of a *dah* slash and he had one finger missing. On January 30th we struck camp and marched to our next halt at Tasu Bum. The path rose to 4,000 ft. and then dropped down through dense forest of bamboo and *taungya* to a stream at 2,900 ft. Ascending from here to the village of Pum Noi, we watched Kachin women weaving their Tartan cloth. From this point the path dropped in some places very steeply to the Khara Hka, a stream at 2,800 ft. Rising abruptly the path led up to Tasu Bum (4,200 ft.), the highest point of our march (14 miles from the last camp). On our arrival we quenched our thirst with cups of cocoa made with Nestle's milk chocolate and water boiled in bamboos. The Kachins here cultivate a small patch of tea, as also oranges, peaches and plums. Blister flies were bad. Villagers brought in a number of peacock-pheasants and a squirrel (*Dremomys*).

On January 31st the party secured specimens of langurs, squirrels (*Callosciurus*) and gibbons, while a cobra and two green whip snakes were brought in by the villagers, as also several birds and small mammals. Here the minimum temperature recorded during the night was 51° and the maximum temperature during the day 84°. On February 1st we struck camp and marched to the river Tapa Hka. Three langurs and a gibbon were collected; once a bison crashed across the path ahead of us. Pitching camp at Tapa Hka (800 ft.) the surrounding area was explored and a few specimens collected. Tracks of tiger were seen and numerous old tracks of elephant. Leeches were much worse here. 'Gooming' at night with jacklights yielded nothing, but Raven secured a Scop's owlet. Baits put out for tiger yielded no result. Gibbons, squirrels and a pheasant were secured by the party on the following day.

Four of the mules and one of the goats became very ill here through eating something poisonous, two of the former dying.

Species of *Dipterocarpus* and *Pterospermum* were frequent, growing to a tremendous size. Aroids were numerous, bird life

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fairly rich, but animal life definitely poor. The temperature recorded was minimum 54° and maximum 78°. Specimens collected on February 2nd were a male gibbon, a *Callosciurus*, a peacock pheasant and some birds. On February 3rd we moved to the Tumri Hka, a distance of about 20 miles, and camp was pitched on a sandbank. The mules kept up marvellously well in spite of the fact that some of the going was difficult: had they been less sure-footed, casualties would have occurred along places where the ground dropped steeply from the path. In one stream we found a quantity of petrified wood including large logs which Raven considered were possibly of the Tertian (Miocene) period, about twenty million years old. Three species of a beautiful wild Begonia were seen and gathered by McCann. The jungles were full of two or three kinds of stately palms. White sap oozing from stumps of saplings and trees, cut by the men clearing the path ahead of us, gave the stumps the appearance of having been whitewashed. A sambhur hind and a muntjac were seen crossing the Tumri Hka in the evening. The young gibbon captured at Pumsin was by now quite tame and flourishing.

On February 4th leaving Tumri Hka at 8 a.m. we waded down the river (650 ft. above sea level) for one and a half hours. Four otters were seen, but we were not successful in collecting a specimen. Quite a number of tracks of elephant, bison, sambhur and tiger were in evidence though few were fresh. From here onwards the greater hornbill was common. Down the stream, we frequently came on places where gold washers had been at work. Crossing the Taro Hka the path led through tall elephant grass and on through dense evergreen and bamboo forest finally entering *taungya* and cultivation. Along the path were tracks of tiger, some quite fresh. A mile from Dalu (Taro) we passed Kolun, a Chin village. Dalu, a Shan and Kachin village on the banks of the Chindwin or the Tanai Hka, as it is known here, was reached at noon. On the way one of our goats was drowned in the river, how this actually occurred we were never able to discover. Some of the outfit, including two boxes of cartridges, some cases of skins and one containing kit, got soaked in crossing the rivers. Baits were tied out in the evening and those of the party who were keen fishermen went afishing, the two fish caught being served up for dinner. Two of the party occupied the local Rest House at Dalu, while the remainder were in tents. We had marched about 130 miles from Nanyaseik. On the following morning, Major Rowley and the writer, crossing the Chindwin in a dugout, set out for a Kachin village, Taga Hku, at the foot of the Naga Hills, west of the Chindwin river. The river flowed for eight miles mainly through fields of poppies (cultivated for opium). Wild strawberries, insipid to the taste, grew in profusion. A heron and two or three other river birds were collected, and Taga Hku was reached at about noon. With the aid of our interpreter the possibilities of a visit to a salt spring some distance away in the jungles were discussed with the villagers. Here we saw our first Nagas or Wangas as they called themselves. Our interpreter informed us that Nagas were actually sections of the Chin tribe.

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Returning we travelled down the Taga Hka on bamboo rafts, shooting rapids, collecting birds, and taking movies, reaching Dalu in the evening. When nearing the western bank of the Chindwin, the leading Kachin drew the writer's attention to what apparently was a fine jungle cock. Fortunately the writer's aim was not good, a torrent of language from a neighbouring hut proclaimed that the owner wanted to know why we were firing at his poultry! On the following morning Rowley and Hopwood went fishing down stream, while preparations were made for an expedition to the salt springs in the jungles at the foot of the Naga Hills. Specimens of squirrels (*Tomeutes* and *Callosciurus*) were secured in the jungle nearby and thirty frogs along the river's edge. On February 7th, McCann and the writer, accompanied by our interpreter, a servant, and seventeen men, left for the salt spring at Lahkaw Hka following our previous route to Taga Hku. From Taga Hku village to Lahkaw Hka, where a camp had been prepared for us in the depth of a vast area of evergreen forest, we had to wade knee deep, two or three miles up the Tara Hka. Following an elephant-path we eventually reached our camp. The huts were of palm-leaves and one joint bed, raised a little off the ground, was covered with a mattress of the same material. Leeches were in abundance and the path to the salt springs, about a mile away, led through an evil-smelling bog. At the salt springs, tracks of elephant and bison, all old, a few fresh tracks of sambhur and those of a large tiger were seen. The tiger was obviously a regular visitor. The salt-lick and its surroundings were truly beautiful—banks of grey or of grey-blue overlaid with brown sandstone. That evening the Kachins brought in a Banded Krait. On the following morning another visit was made to the salt-lick. The tiger had again visited the salt-lick during the night and some of its droppings were found to be chiefly composed of salt-lick earth. There was nothing salt in the taste of the earth of this lick and, as in the case of most so-called salt-licks in India and Burma, it was hard to determine the reason for its popularity. The Lahkaw Hka salt springs are in two parts. One of the banks at the upper lick had been worn into a curve by elephants continually rubbing against it. Kachins were deputed to erect two machans over the licks, on the chance of seeing the tiger during the night. But our hopes were however not fulfilled, we had a wet night's vigil without the reward of seeing a single animal. At the lower and smaller lick elephants had holed the banks with their tusks in several places. The Kachins informed us that we were the first Europeans to visit the salt-lick and, in fact, that part of the country. On the 9th February the salt-lick was re-visited, photos and samples of the earth being taken. During the day we collected some birds and a type of *Callosciurus* quite new to us and possibly a new form. Kachins brought in a number of birds including pheasants, partridges, and a squirrel (*Dremomys*), also a small pit viper. Snares laid for pheasants in the jungle around produced victims daily. It is obvious that the Kachins live well of the jungle and in view of the large number of snares set for birds, porcupines, etc. in the vicinity of Kachin

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villages it is amazing that such a large number continue to exist. Snares for pheasants were invariably of the bent-over stick type with a noose held down on a small circular patch of cleared ground, the bait being small red berries which appeared to attract the bird. On February 10th we struck camp and returned to Taga Hku collecting *en route*. Leeches were very bad after the previous night's rain. A number of birds were collected, among them a serpent eagle. We found the Tara Hka deeper afer three days' rains. When near Taga Hku, McCann and the writer were both stung by the giant stinging nettle (*Laportea crenulata*) which is common on the banks of the rivers and streams in those parts. Contact with water increased the pain from the stings considerably and their effects were felt for three days. At Taga Tku we pitched camp. A 'goom' after dark produced no results although a muntjac and a small animal, probably a civet, were seen. On February 11th two Pied-Hornbills were secured on a *Ficus* tree nearby before leaving for Dalu, also a diminutive squirrel (*Tamiops*), two monkeys (*M. rhesus*) and another specimen of *Callosciurus* similar to that obtained at Lahkaw Hka. Boarding dugouts, we were paddled by the Kachins down the Taga Hka, shooting several rapids. On the way down several birds including another Serpent Eagle were collected. Dalu was reached at about 5 p.m., after taking photos of a few semi-wild buffalo. Hopwood and Rowley had in the meantime returned from their fishing trip, the latter having caught several fish, but no Mahseer. One of the baits had been killed by a tiger, but Raven had no luck sitting up. On February 12th Vernay, Hopwood, Rowley and the writer left in five dugouts for the Partip Gorge, about 30 miles up-river. Arriving at the lower part of the gorge in the afternoon, we camped on the rocks bordering the river. The river here was narrow and obviously very deep, while the evergreen forest descended steeply to nearly the water's edge on both sides. Large splashes all through the night indicated the presence of turtles. A langur was collected on the journey up. On February 13th an early start was made upstream; three or four birds including a grey heron were collected on the way. Above the Partip Gorge we found gold diggers at work and landed for a few minutes to watch them. Lunching on a sandbank, we continued our journey finally tying up at 3-30 p.m. on a large sandbank. Vernay and Rowley fished for the pot while the writer collected birds in the adjacent forest. It was noticeable that the slots of sambhur in these jungles were very large, possibly due to the swampy nature of the jungles in wet weather. Similarly the semi-wild buffalo leave tracks almost as large as quarter-plates. On the following morning, while breakfasting at 5 a.m. peculiarly raucous calls were heard from the other side of the river and a pair of eyes was reflected in the light of a jacklight flashed across. Rowley quickly slipped across the river with his rifle and shot one of a pair of large Fishing Cats, a fine specimen and a welcome addition to the collection. Returning to Dalu, our progress down-river for the first hour was very slow on account of dense mist. The Partip Gorge is indeed beautiful with its steep forest-clad sides and low banks of rock, either bare

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or fern- and moss-covered, while the water appeared to be as still as in a pond. Although the journey up had taken nearly two full days we reached Dalu in one, which involved hard work for the boatmen. On the way down, two hawks were seen attacking a great eastern purple heron, which, probably would have been killed had the hawks not been disturbed by our presence. Vernay also saw a hawk kill a common egret and was able to recover the latter. At Hopwood's suggestion the five boats took part in a race with only the boatmen paddling. We had noticed that Hopwood's boatmen had been paddling in a most regular and disciplined manner for sometime prior to this, and it transpired that he had been preparing them for the race, needless to say his boat won! Dalu was reached at 7 p.m. the journey having taken just 12 hours. On landing the writer sent off four rocket (firework) cartridges much to the boatmen's delight. Raven had had no luck with the tiger for which he had sat up three nights, although the animal was heard giving tongue far and near. In our absence, McCann had added mammals and birds to the collection, and while engaged in the good work met with a demonstration from a tiger late in the evening in dense undergrowth. He sat up for this tiger (over a goat) with no better success. The minimum temperatures recorded at Dalu during the nights ranged from 54° to 58° and 76° to 80° during the day. On February 15th, four Wanga Nagas came in and were subjected to photography for some time. Their village was apparently away in the interior of the Naga Hills, at an elevation of about 8,000 ft. They were small men compared to the Nagas we saw later on, but even so they were fine specimens of humanity and bore themselves well. Endeavours to persuade these men to take us to their village met with no success: they were adamant in their refusal on the grounds that it would be too dangerous. On February 16th Hopwood left us to return to Rangoon taking with him cases of prepared specimens and 58 of our mules for which we no longer had loads. The writer then developed fever and had to lie up. McCann, while sitting under a *Ficus* in fruit, made an excellent collection of gibbons (capturing a young one as well), flying lizards and squirrels. In the evening Raven and Vernay took flashlight photos of the interior of the Kachin houses.

While at Dalu, a member of the party received a letter addressed to him 'C/o Veterinary-Hospital Expedition' (for Vernay-Hopwood Expedition)! The 17th found the writer still in bed with fever. McCann added to his previous day's collection under the fig tree, and in the adjoining jungle secured four more gibbons, another specimen of the flying lizard, and some birds. Unfortunately the young gibbon caught alive on the previous day strangled itself to death in McCann's tent. By February 18th the writer's fever had eased off and camp was struck. A short journey was made down river to Lakchang Ga, a Kachin village, on the western bank. The mules swam across the river while our outfit was taken across in two twin boats formed of two dugouts lashed together with a curved mat roof over the centre. Both Lakchang Ga and Dalu are surrounded by paddy fields bordered by dense

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Wanga Nagas at Dalu.



Wanga Nagas at Dalu. Note the buffalo rib worn in the hair.

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evergreen forest. Around these villages a species of lemon, originally cultivated, now grows in wild profusion, especially in abandoned *taungya*. The fruit is quite uneatable. The Kachins displayed the keenest interest in us and in our work. At Dallu we were favoured with the visit of a Chin man and two women who had come on a three days' journey to catch their first glimpse of white men. They brought eggs and a piece of hand-woven cloth and in return received half a bag of salt, which to them was worth far more than it sounds. The headman of Lakchang Ga was a man of some substance and importance, owning a large tract of country, mostly heavy forest including however several Kachin and Chin villages. In times past the Chief of Lakchang Ga owned a number of slaves, who were bought their freedom by Government, the Chief receiving some thousands of rupees in cash and, as the slaves continued to work for him contentedly though free he did not lose much! At the request of the Kansi Duwar, the Chief of Lakchang Ga had continued the good work of clearing a path for the expedition on the western side of the Chindwin. Between these two Chiefs about 85 miles of path had been cleared for the expedition through dense jungle, no mean work, and without which, the expedition's progress would have been fraught with greater difficulties. Leaving Lakchang Ga on February 19th we journeyed down-river for about 8 miles pitching camp at Rasa, a Chin village on the west bank. The Chin villages are noticeably not as clean or as orderly as those of the Kachins. In the evening a species of langur not yet obtained (*Pithecus pileatus*) was secured. On the following morning, camp was struck and the expedition now divided, Vernay and Rowley continuing down-river in the boats, while Raven, McCann and the writer carried on west of the Chindwin with the mules. The path from Rasa followed the bank of the Chindwin for a mile or two and then cut through heavy evergreen jungle. At one or two places on the bank small patches of surface coal were noticed. Pausing for refreshments at the deserted village of Jantang (750 ft.), we finally arrived at the place selected for our camp on the Tagum Hka shortly after 3 p.m. (elevation about 750 ft.). The path from Jantang had taken us up to 1,150 ft., and we crossed the Mergui Hka two or three miles further before reaching our camping site. Here three langur (*Pithecus pileatus*), including a young one, and a female gibbon and her young were secured. At Jantang we collected several specimens of sunbirds. Heavy rain fell during the night. For dinner we ate langur but thought it a bit tough. We found that our otherwise excellent 1 in. = 1 mile maps were a bit out for this region, the Tagum Hka not being marked in at all. The writer was nearly sucked dry by the father and mother of all leeches, of a colossal size, and this monster was quickly consigned to the fire. One of the party's 12-bore guns had ceased to function, but temporary repairs to the broken lock-spring were cleverly effected by Raven, quite the most handy man of the party, even to the extent of resoling boots. February 21st saw us add two gibbons, two grey-tailed *Callosciurus* and two macaques which were new to the collection.

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These macaques were closely allied to *Macacus rhesus*, but larger and more heavily built. It is now almost certain that they were the long-tailed *rhesus* of Burma, specimens of which are badly required by the British Museum. The forests in these parts include many species of *Ficus* and *Dipterocarpus*. On the following day a large langur and two grey langurs collected on the east bank of the Chindwin, were brought in by Vernay who visited the camp from his boats away down on the Chindwin river. Temperatures recorded at Tagum Hka were 54° to 57° minimum and 66° to 71° maximum. On February 23rd we struck camp and while marching came on a troop of gibbons of which Raven took movies, and subsequently a male and a female were secured. I should have mentioned that the variations in colour in these Hoolock gibbons from adolescence to maturity is most interesting. In infancy the colour of both sexes is silvery, gradually darkening, until within a year both sexes are black. On reaching the adult state however the female becomes fawn-coloured, the male remaining black.

One of the most interesting features of the collection was the natural bar afforded by the Chindwin river. In the case of nearly all species of mammals we found, the male adult gibbons, east of the Chindwin have a patch of white hair in the region of the scrotum, apart from the white bands across the forehead, the bridge of the nose and under the chin. West of the Chindwin river the adult male has the white band across the forehead, but the white hair round the scrotum is completely absent. By far the most interesting differences however were displayed in the range of squirrels (*Callosciurus*), collected on both sides of the Chindwin.[1] Whereas from Nanyaseik to Dalu the colour of the animal remained fairly constant, it was found that on crossing the Chindwin river, west of Dalu, the *Callosciurus* with their almost white tails presented quite a different appearance. This type remained fairly constant all through our journey on the western side, the only variation occurring in the amount of white to be seen on the tail. For instance, on the 23rd February, two specimens were secured with tails slightly darker than those collected on the western side previously.

Our next camp was located at Changa Hka about 12 miles from Tagum Hka. The path from Tagum Hka to Changa Hka at first rose rapidly to 1,200 ft. finally dropping steeply to our camp site at 1,700 ft. Two gibbons and some specimens of *Callosciurus* were added to the collection. On February 24th sixteen mammals were collected, including four gibbons, ten *Callosciurus*, one *Dremomys* and a young macaque. As a collecting area this seemed a promising one, but unfortunately we had to move on as difficulties arose in regard to fodder for the mules. *Callosciurus* especially were very plentiful and there were evidences of

[1] A coloured plate with descriptions of seven different colour forms of one species of squirrel (*C. sladeni*) collected along the Chindwin River between Hkamti and Yin by the Society's Mammal Survey will be found in the Society's *Journal* (vol. xxiv, p. 224)—Eds.

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a number of muntjac. The minimum night temperature 54° and the maximum day temperature 64°. A dinner of squirrels proved good eating. We left Changa Hka next morning the path rising at the start very steeply and gradually ascending till a height of 2,900 ft. was reached, whence we descended to 2,110 ft., the elevation of our next camp at Hai Bum. This is quite a large Chin village, not however shown on the maps, and about 15 miles from our last camp. On the way specimens of *Ratufa*, five gibbons and a langur were collected, and one or two birds, and unfortunately we wounded and lost two or three langurs. While chasing these langurs McCann had rather an unpleasant fall leaving him rather shaken. On our arrival at Hai Bum the headmen of seven villages paid a call and brought Naga spears, dahs, chickens, eggs and plantains, all of which were duly paid for! We were now in the Chin country; and the Chins brought us pheasants (both silver and peacock), a number of birds, and three brush-tailed porcupines. After tea a ceremonial visit was paid to the house of the Headman of Hai Bum and we all, with the aid of our interpreter, conversed round a fire in his house, sitting on little rattan stools. He shortly produced a certificate given him by the Assistant Superintendent, Frontier Service, a few years before, in which it was indicated that the Headman had promised to hold no more human sacrifices and to keep no more slaves. Our query as to whether he had kept his promises was received with considerable mirth! When human sacrifices were prevalent the person selected, usually a slave, had a really wonderful time for quite a lengthy period before he was sacrificed. Fed on the fat of the land and country beer (to fatten him up) and doped with opiates, the victim probably did not worry at all on the score that he was soon to shake of this mortal coil.

The Kachins, Chins and Nagas are all spirit ('Nat') worshippers, and the symbols of their worship are to be seen in the large number of funnel-topped 'Nat' poles outside their villages and their sacrificial houses. Semi-wild buffaloes are retained entirely for sacrificial purposes and in no case is any milk of cattle or buffaloes drunk by them; in fact they consider milk to be in the nature of excreta. Raven, who had had years of experience collecting in the Dutch East Indies was extremely interested in these tribes and found that in features, dress, many of their customs, in the black fibre 'garters' worn below the knee, and in other respects they corresponded closely with the Dyaks of Borneo and the Taragas of the Celebes, many words also being common to or similar in their languages. In our subsequent expedition to the Malayan jungles, Raven and the writer found certain similar features in the case of the Sakais of Malaya, and his view was that at one time an Indo-Malayan migration southwards from the north of Assam and Burma must have taken place.

On February 26th, specimens of *Callosciurus*, a *Tomeutes*, a langur and a gibbon were collected and a variety of birds, fifty of which, including a peacock pheasant and a partridge, were brought in by the Chins. The Chins are adept at shooting birds and squirrels, and clever at spearing them with sharpened bamboo

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splinters stuck into bamboo poles. Raven was pleased at being able to secure for the anthropological side of the collection a piece of bark cloth made from the bark of the Upas tree (*Antiaris toxicaria* Lesch.), from which also a deadly poison is collected by these tribes for the tips of their darts and spears. Here it is interesting again to record that the same tree is utilised for the manufacture of bark cloth and the extraction of poison by the Dyaks and Taragas of the Dutch East Indies. On the following morning we left camp early and the day's collection comprised a greater hornbill, a number of *Callosciurus*, four *Tamiops*, a *Ratufa* and a number of birds including an oriole and an owlet. This being the Chin New Year's day the Headman brought us two goats, a fowl and eggs, expecting of course the usual return in cash which was duly paid, and invited us to a Chin dance in the evening. At their request six firework cartridges were fired by the writer, while Raven took flashlight photographs of the scene which was most picturesque: dancing in a complete circle, men and women with arms interlocked, the men sang the first phrase of each song and this was taken up by the women and boys. The Headman's son in particular presented a fine appearance in his tribal dress, akin to that worn by the Nagas. On February 28th we were just about to leave camp when Vernay and Rowley turned up having climbed about 1,600 to 1,700 ft. up the steep path from the Chindwin river. They brought with them a specimen of Slow Loris (*Nycticebus*) and another specimen of the Long-tailed Rhesus. They had had good fishing, especially at the Kyaukse rapids where unfortunately Vernay lost a mighty mahseer; they were the first white men to fish there. The total collected for the day amounted to three gibbons, a number of squirrels, and birds including a peacock-pheasant secured while displaying. A 'goom' in the jungles at night produced no result. For night work these jungles are like a grave-yard, and do not compare with the evergreen jungles of South India in the amount of life held. Temperatures recorded varied from minimum 56° to 63° to maximum 82° to 92°. An interesting feature of Hai Bum is its boat-building industry. Although situated 1,600 or 1,700 ft. above the Chindwin river fine big dugouts were carved out of the trees of the forest adjoining Hai Bum and dragged down to the river far below.

On March 1st, several *Callosciurus*, a *Tomeutes*, three gibbons and a number of birds were collected while the Chins brought in birds, pheasants, a snake and two *Tomeutes*: the last shot with cross bows.

Neither the Chins nor the Kachins seemed to be able to grasp the idea of driving animals towards guns. If sent in to the jungle they would invariably go straight towards the object to be driven instead of encircling it, thus driving it in the opposite direction. Another point they have in common is their habit of cutting leaves to sit on when sitting on the ground.

We had now collected over 100 mammals since leaving Lakchang Ga alone. The next day ten more mammals were added to the collection including three giant squirrels, two gibbons, a langur and four specimens of *Callosciurus*, also a number of birds

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and a terra-cotta-coloured snake, probably a species of *Zamenis*. The collections of mammals were made at elevations between 700 ft. (near the Chindwin river) and 1,700 ft. Temperatures during the last two days and nights recorded were 56° minimum and 84° and 87° maximum. The locals brought in 27 bats consisting of *Hipposiderus armiger*, *Rhinolophus* and a *Pipistrellus*. The three goats presented us previously by the Chins were today slaughtered for the Museum, and the meat utilised for the pot and very good it was too, not a trace of goaty flavour. The Chins, in these parts, like the Kachins, are not good tree climbers and prefer felling a tree of any size to climbing it. We found the Chins less talkative than the Kachin fraternity and possessed with a somewhat less degree of humour. Large species of *Dipterocarpus* were plentiful in the forests round Hai Bum and from these the dugouts were hewn. Fine specimens of a species of *Pterospermum* and of *Elaeocarpus* also abounded, the nuts of the last two being eaten by *Ratufa* and *Callosciurus*. Many and large also were the Upas trees (*Antiaris toxicaria*) from which the Chins, as already stated, made bark cloth and derived poison for darts and spear heads. McCann drew the writer's attention to the fact that little puffs of 'smoke' seemed to appear as the 'fruit' fell from these trees which for a time puzzled us, but we eventually discovered that they were actually puffs of pollen dust and probably Nature's means for the dispersal of the pollen. The fruit lay in abundance on the ground, but neither mammal nor bird were seen to feed on it.

On March 3rd camp was struck and we left for Sailung on the Chindwin river passing through the village of Lachu Ga *en route*. Our path from Hai Bum to Sailung took us up to 2,500 ft. and then dropped rapidly down the valley to the Chindwin. The views obtained of the surrounding country and of the Chindwin valley were superb. A specimen of *Callosciurus* and some birds were collected. Sailung was reached at noon and here a message from Mr. Vernay was handed to the writer intimating that the mules were to be paid off and the journey down river to Singkaling Hkamti made in twin dugouts connected by a bamboo platform, in pontoon formation. Their accounts settled, the muleteers swam the mules across the Chindwin. The men first pushed out into the river on a raft and when some distance off the shore called to the mules which at once entered the water and commenced swimming—a most interesting spectacle. Pitching camp on a large sandbank at the river's edge, McCann and the writer paddled up-river in a dugout that evening in the hopes of obtaining further specimens of the long-tailed *rhesus*. On the way a peacock was unsuccessfully stalked. It was fairly dark as we came up to a troop of macaques on a tree overhanging the river. Landing on the rocks at the water's edge we climbed the banks which were almost sheer. While attempting to locate the macaques, McCann slipped and just saved himself from a nasty fall though his gun sustained a little damage. He was certainly the champion faller of the party! At dusk while using our jack-lights, McCann stalked and fired at the glowing embers of a fire left by fishermen on a sandspit taking them for the eyes

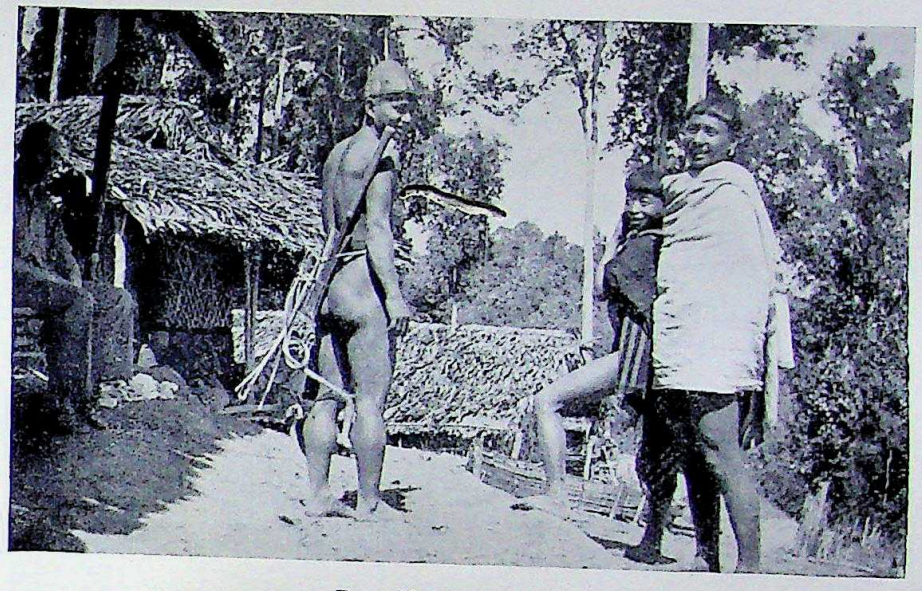
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of an animal! Curried turtle eggs were served for dinner that night and proved quite tasty. On the following morning we left Sailung at 8 a.m. in three twin boats with the double flies of tents rigged up over each boat. Movies were taken of men locating and digging out turtle eggs on a sandbank, and an otter was shot, but unfortunately sank and was carried away by the current before it could be recovered. Two otters were seen and were found to be eating a young turtle. Changnaling Hkamti was reached at 6 p.m., Vernay and Rowley meeting us at the riverside and introducing us to the Sawbwa of that State. The Sawbwa proved quite a useful collector and added a number of specimens to our already valuable collection. Specimens of *Callosciurus* collected here showed a distinct change in colouration being very much lighter than those collected on the eastern side up-river. Next morning Rowley and the writer accompanied the Sawbwa on a round through the jungle nearby. Three specimens of *Callosciurus* were obtained and a number of birds. Two tanks holding duck, geese, snipe and other water fowl were visited but we were only able to secure a single snipe, shot by the Sawbwa. The Sawbwa used Vernay's ·22 rifle on doves with considerable accuracy. In the evening a further specimen of *Callosciurus* and an owl were secured and later, a group of Nagas came into camp and gave us an exhibition of their war-dancing and singing which was quite impressive. Most of the Nagas had splendid deep voices and their chanting was most harmonious. The whole was supposed to represent a party out head hunting and the dance on their return with their spoils. On March 6th Vernay, Rowley, Raven and the writer, together with the Sawbwa, left for the village of Hahti, away in the Naga Hills. This village had been concerned recently in a successful head hunting expedition. Crossing the river in boats we walked for about 18 miles reaching an elevation of 2,200 ft. It was a very hot day and the switch-back nature of the route made it all the more tiring. Our loads were carried by Nagas who rested for a little at the Naga village of Kawai (half way) while we had our lunch. The writer secured a couple of gibbons and a *Tamiops*, while the Sawbwa shot a *Callosciurus* and a partridge. On approaching Hahti, which we reached at 5 p.m., one of the headmen advanced out of the village to meet us and, satisfying himself that the party had not come with any hostile intent, he led the way back to the village, and we were accommodated in huts that had been prepared for a military expedition expected soon to deal with an head-hunting affair. It was noticeable that the Naga villages were generally situated on bare hill tops or ridges with the jungle cleared away all round, presumably to safeguard themselves as much as possible from surprise attacks. That such attacks could nevertheless be carried out successfully was shown by the fact that the Nagas of Hahti and five other villages attacked at dawn the large Naga village of Wantung about 30 miles away. First completely surrounding the village, the attackers on three sides yelled and, as some of the inhabitants, in panic, attempted to escape in what appeared to be a safe direction, fifteen were cut down and decapitated. Satisfied with their spoils,

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Rasa Nagas at Hahti.



Camp at Singkaling Hkamti.

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the attackers returned and divided the heads equally amongst the six villages, each village being allotted two and a half heads! A report on the affair was transmitted to Government by the Singkaling Hkamti Sawbwa, and the village was heavily fined as being the instigators of the raid. We were informed that the Wantung villagers would certainly retaliate in due course, though possibly not for some years. It should be mentioned that the Sawbwa had been induced to take us to [illegible] with a promise of Vernay's 20-bore shot gun and 200 cartridges! We were shown a hut where the Nagas placed their dead, the corpse or corpses being kept on a raised platform inside. Eventually the huts collapse together with the remains of the dead and a ceremony is then performed over the skull which is subsequently put back with the remains. At times we were unpleasantly reminded of the proximity of these burial huts when the wind happened to be blowing in our direction.

Magnificent specimens of manhood these wild Nagas! Their dahs (long-handled choppers), stuck in short wooden sheaths slung on their backs hang nearly vertical up the centre of the back and are drawn out over the shoulder—a contrast to those of the Kachins and Chins, who carry their dahs slung to one side. The blades of their dahs are narrower and considerably lighter; and in most cases the slings are adorned with a portion of a tiger's or panther's jaw. The Naga men were nude except for a short black cloth hanging from the waist in front, and the women wore a short black skirt of coarsely-woven material. The men always carry spears, the blades of which are sometimes protected by a bamboo sheath. Both men and women are tattooed on the face and body.

On the following morning the writer collected a specimen of *Callosciurus* (both this specimen and that secured on the day before had very much darker feet) while the Sawbwa secured a *Tomeutes* and three or four birds. Photos, both still and movies, were taken in the village of the 'Nat' poles, the war drum, and the skulls of the victims of the recent raid. A portion of one of their victims' hands was nailed up on a tree-trunk at one of the entrances to the village while the remains of a tiger-skin were stretched over a wicker frame above the human skulls. The Nagas here appeared to have a special breed of goats with black heads and white bodies. One of these was purchased for the Museum, the meat being given to the Nagas. The expedition also paid for two pigs which were slaughtered by the Nagas for the feast. Tied up in the village was a fine specimen of a bull Mithun. The remainder of the herd were apparently in the jungle and were said to return to the village at nightfall. As in the case of the semi-wild buffaloes to be found in the vicinity of Kachin and Chin villages, these animals are only used for sacrificial purposes. The buffaloes were rarely aggressive and would generally crash away into the jungle on our approach. In the afternoon the Naga women gave us an exhibition dance while the men put on their full war regalia and reacted the outgoing and return of a Naga head-hunting expedition. First the Naga warriors

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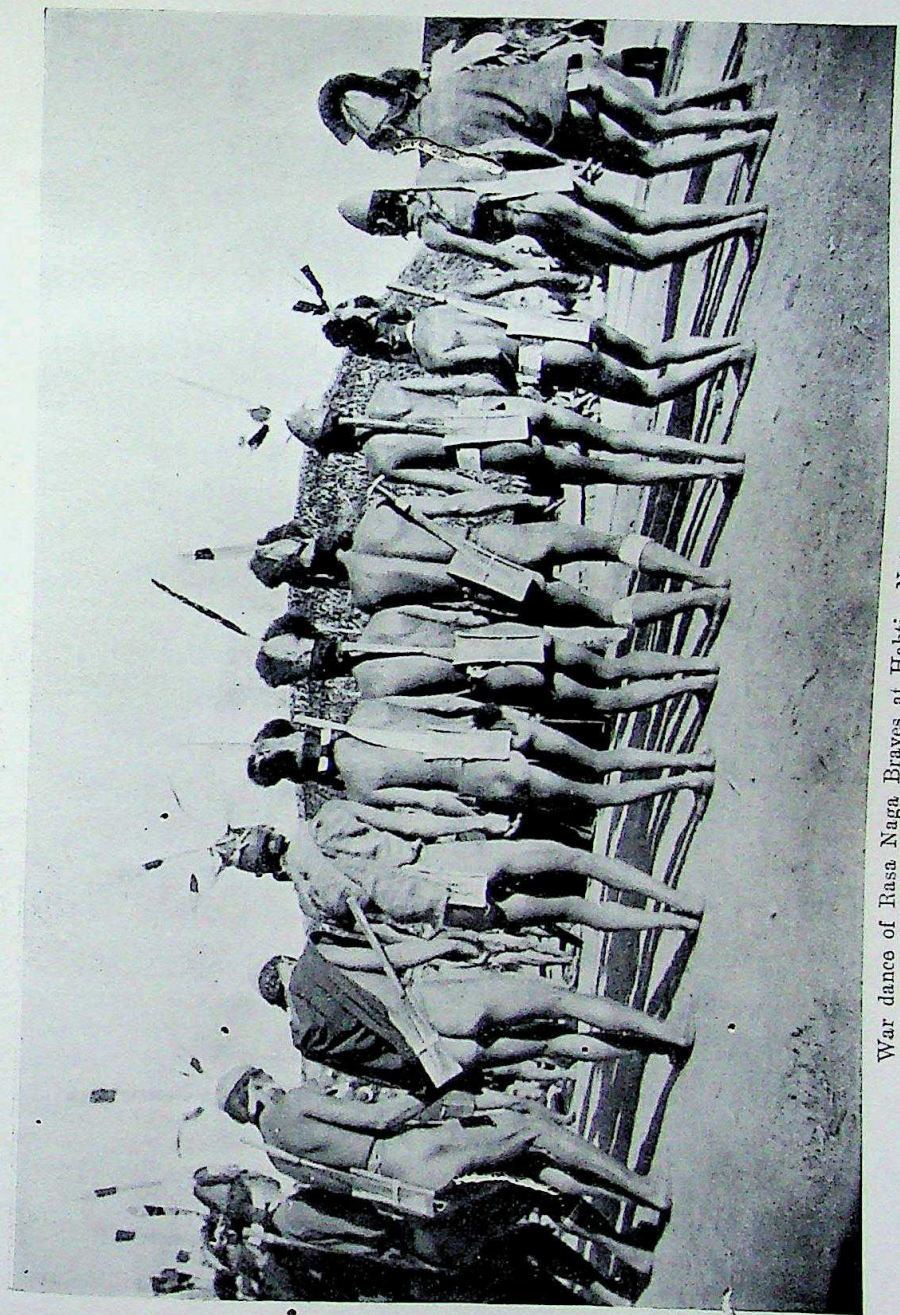
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were called together by the beating of the war drum (a hollowed-out tree trunk). This was done in a most rhythmical way with poles, and the party then left the village. Returning with their spoils the party danced into the village headed by two warriors dancing backwards at the head of the column. As they reached the centre of the village the column formed into a ring and with dahs drawn the dancing and chanting continued for some time, a most impressive scene. Some of the warriors carried oblong-shaped shields of either stout leather or beaten-out kerosene tin. The men's war helmets, or wicker caps were topped with a ring of bear's fur and adorned with hornbill feathers, while in front, in some cases is sewn a pair of very fine boar's tushes. The Head-men's helmets were generally crowned with a thick fringe of goat's hair dyed red. During pauses in the dancing, exhibition duels with spears and shields took place between a couple of warriors, while the ever-present funny man was really amusing with his antics—a true clown. The Assistant Headman, a magnificent specimen, when not drinking beer out of a bamboo receptacle, was continually exhorting the men to further efforts. After it was all over the men were presented through the Sawbwa, with beads and the women with skeins of yarn and needles, all of which were much appreciated. At night the village presented a most animated appearance, large fires burning in the centre of the village, and sounds of mirth emanated from the houses around. Built upon stilts, as are the Kachin and Chin houses, the Naga huts were akin to those of the Chins in appearance, not being so clean or well kept as the long houses of the Kachins. After dining we returned to the village where Vernay and Raven took flashlight photos of scenes in the interior of two houses. In the first the inhabitants were sitting round a pot of boiling pork and goat's meat, in the second house, the people had just prepared themselves for the night; a young couple were on a bench to one side, a group of bachelors were lying on the floor in the centre of the house, and other inmates occupying suitable spots in the long room. Many of the Nagas kept up a Gregorian-like chant to a late hour, their musical voices blending in fine harmony. We were told that the tiger which had once borne the skin now hanging in tatters on the wicker frame had been shot by the Headman's brother with a bow and poisoned arrow. We were up early next morning and after purchasing a few things the Nagas brought for sale we bade a regretful farewell to Hahti and its Nagas, a cheerful and good lot they appeared to be.

The journey back to Singkaling Hkamti was considerably easier than the march up. A *Tomeutes* and a gibbon were collected. Some of the jungle passed through was typical Serow country and evidence of their existence was provided by the number of Serow horns worn by the Nagas on their dah sheaths, the Serow being hunted by the Nagas with their dogs. On reaching the Chindwin river, Vernay, Raven and the writer stripped and had an enjoyable bathe in the cool water. McCann had not been idle in our absence having collected about two dozen specimens of *Callos-*

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War dance of Rasa Naga Braves at Hahti. Note the position of the *dahs*.

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Dance of Rasa Naga women at Hahti.

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ciurus, a *Ratufa*, *Tamiops*, two gibbons, a Loris (*Nycticebus*), and a number of birds.

I should mention that at Singkaling Hkamti, Raven discovered that Vernay had found what proved to be a valuable addition to the collection, the fossilised tooth of a Stegadon (a pre-historic elephant) anything from two to thirty million years old. Vernay had picked this up while fishing on the banks of the Chindwin river near the Kyaukse rapids. Subsequently further pre-historic fossil remains were presented to the collection by Mr. Bodekar, District Forest Officer at Mawlaik, earning the gratitude of the expedition and the Museum.

As a reward for arranging our visit to Hahti the Sawbwa of Singkaling Hkamti was duly presented with Vernay's 20-bore shot gun and cartridges.

The 9th March was taken up in a re-sorting of cases of stores, camp equipment, calls on the Sawbwa and a further visit to the jungle around. During dinner one of our servants nearly trod on a Banded Krait which McCann adoritly caught. Later two of the party 'goomed' up river in a dugout but had no luck. A 3- or 4-lb. fish however, possibly dazzled by the lights, leapt right over the boat hitting the front boatman in the back!

Singkaling Hkamti is the capital of the Shan State of that name. We were able to obtain here a few provisions such as condensed milk, cigarettes, sugar, potatoes, etc. An extensive area of paddy cultivation extended to the east and south of the village. Beyond this lay a mixed forest of evergreen and deciduous trees, chief among the latter being *Ficus glomerata*, *Woodfordia fruticosa*, *Elaeocarpus* sp., *Bombax* and *Phyllanthus Emblica*. A certain amount of tea is cultivated on both banks of the river and the writer noticed a few coffee trees (*arabica*) growing in the compounds of the houses.

While we were striking camp on the 10th the villagers brought in a civet cat and two turtles. Loading all our equipment on twin dugouts we travelled downstream till nearly dusk, dining and sleeping on the sands at Heinsun. The Sawbwa accompanied the expedition downstream as far as the limit of his territory. Early next morning the party divided to collect on both banks, the total collection for the morning resulting in a *Ratufa*, nine *Callosciurus* and two macaques. Quite a large area of tea is cultivated here, typical of Shan villages in tea country. Leaving Heinsun at noon we tied up again at Linhpa in the evening. A 'goom' after dinner produced a civet (*Paradoxurus*). On the 12th collecting proceeded on both banks of the river. Continuing our journey at noon Kunghein was reached late in the afternoon, camp being pitched on the west bank at the confluence of the Nanswa and Chindwin rivers. 'Gooming' after dinner (at which an excellent squirrel curry was served) an owl was added to the collection. Vernay and Rowley set out on a fishing expedition up the Nanswa river next morning, while the remainder of the party collected on both banks of the Chindwin. The Sawbwa went out collecting daily and produced quite a number of specimens. That night a peacock was collected by Raven while 'gooming'! On the 14th

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Vernay and Rowley returned having had no success whatever. During the day 35 *Callosciurus* including four with white tails similar to those previously obtained at Taga Hku, a crab-eating mongoose (*Herpestes urva*), a *Dremomys* and a number of birds were collected on both banks of the river. 'Gooming' in the evening McCann and the writer drew a blank, but Raven returned at midnight with a civet, five turtles and some of their eggs. He had come on men who had turned a turtle over and were digging out its eggs. While watching them Raven spotted four more turtles and turning them over captured them too. Unfortunately two managed to right themselves and escaped. They had been left lying on their backs on the sand near our cots to be dealt with in the morning. Our departure from Kunghein was delayed by the work on the turtles, and in the meantime a few birds were collected. This area was quite one of the best for squirrels. The village lies on the eastern bank, and near our camp was a pagoda standing high over the confluence of the Nanswa and Chindwin. To the east of the village was the usual extensive tract of paddy lands beyond which lay the jungle, a feature of which was an abundance of large *Dillenia indica* trees, their fruit continually dropping off with loud thuds. The jungle bordering the river on the western bank here is a dense mass of bamboo and cane beyond which lies a forest of large trees composed of many species of figs and *Elaeocarpus*. Large stretches of old *taungya* covered with dense growth including *Zalacca* and *Calamus* palms made collecting difficult. A certain amount of tobacco was cultivated on both banks of the Nanswa at its junction with the Chindwin. Leaving Kunghein at noon, camp was pitched at a village named Moklok. Hearing from the villagers that elephants were raiding their crops nightly, two of the party visited the village cultivation on the 16th morning to see the damage done, but found that the elephants had not turned up during the night. Collections on both banks comprised a langur, a Rhesus macaque, three *Callosciurus*, a *Tamiops*, a *Tomeutes*, two large hornbills, and other birds. Leaving at noon we landed at Malin, where a 'pwe' was in progress, and visited the stalls and shops on the riverside. Proceeding down-river we arrived at Minsun in the afternoon and here bade farewell to the Sawbwa, Minsun being the southern limit of his State. From here we carried on till evening, pitching camp on the sandbank at Awthaw for the night. Within 200 yards of camp a langur was collected, definitely different from specimens obtained up river, one of a troop in a tope of *Dillenia* trees. The weather was getting noticeably warmer every day. The specimens of *Callosciurus* collected on the east bank were still different from those on the west, while *Tomeutes* on the east bank were yellowish on the underside compared to the grey of those on the west bank. Ticks were very bad in the areas from Singkaling Hkamti southwards.

Early next morning, the 17th, the whole party visited the tope where the troop of langurs were seen on the previous evening and a further six langurs were added to the collection before breakfast. We were afloat again at noon and arrived at Tamanthi, about 14 miles down-river just after sunset. On the way down an otter

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was shot but unfortunately sank before it could be recovered. Our boats were moved to near the Tamanthi Rest House which we occupied. Tamanthi, with its Post and Telegraph office, fortnightly postal service and military police outpost, was our first real link with civilization again. The local doctor and the Subadar of the military police called on the leader of the expedition and the former was able to diagnose a case of illness among our servants as that of appendicitis, the first casualty among the staff. On the 18th camp provisions were checked up and supplies replenished from the local shops, while the writer and Raven made some tomato jam which we considered excellent though not apparently appreciated to the same extent by the remainder of the party! The *Callosciurus* collected here exhibited a paler form than those collected previously. Vernay went through the floor of one of the rooms in the bungalow grazing his leg rather badly. The appendicitis case was taken on board the Government Mail Launch (a stern-wheel paddle steamer) for the hospital at Homalin or Mawlaik.

Engaging two small dugouts next morning, the party travelled down both sides of the river collecting squirrels, several birds including a cormorant, a darter and a tern; also a crab-eating mongoose. Reaching Sinnaing in the evening we dined and continued the journey in the two small boats with headlamps, Rowley and the writer occupying one boat followed later by Raven and Stubbs, the skinner, in the other dugout. Both Vernay and McCann were feeling unwell and came down on the larger boat-rafts. Rowley and the writer taking two-hour shifts collected two owls and three nightjars.

At dawn on the 20th we landed at Hulaung and were joined by Raven shortly afterwards. Here more squirrels and several birds were collected including a fine fish-eagle. The *Callosciurus* from this area showed a much whiter coat than any previously secured. Raven and the writer were badly stung by the poisonous giant nettles (*Laportea crenulata*), the *taungya* on the borders of the river being full of it. After two or three days our arms and legs were still most painful. All along the eastern bank were a number of beautiful *Bauhinia* trees in flower. Camp was pitched for the night at Maungkan, the writer landing and walking along the east bank for the last few miles collecting two specimens of *Callosciurus*, a Rhesus macaque, two Imperial green pigeons and a few other birds. At dusk four bats were secured on the western bank.

On the 21st Vernay and Raven left in small boats on a fast run to Homalin, while the rest of the party followed on down-river collecting on both banks. That night camp was pitched on a sandbank in mid-river opposite the village of Kawya, quite a large place bordered on the east by an extensive area of tea. Here two *Callosciurus* were collected, the tails being quite white and their bodies nearly so. The 'Tuck-too' lizard call was heard by us for the first time. More attention is obviously paid to the tea here, the plantations being of a better standard than hitherto seen.

We found a great difference between the Shans who are Buddhists and do not take life, and our former guides the Kachins

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and Chins, the Shans being obviously not interested in the fauna sought for. That night an amusing incident occurred though rather riling to the writer at the time. The party, 'gooming', had separated and the writer managed to secure our only specimen of the large Yunnanese flying squirrel (*Petaurista*), a fruit bat (*Cynopterus*) and two birds. We were to foregather at midnight on the river-bank. The writer's guide however did not seem to understand this, with the result that camp was not reached till 2 a.m. Every effort to make the guide return to camp only resulted in a long journey in the opposite direction! A few minutes after camp was eventually reached (Rowley and McCann having returned two or three hours earlier) a violent gale suddenly sprang up blowing down mosquito-nets and nearly carrying away a tent off one of the boats. The gale subsided after half an hour as quickly as it had started. The writer, being still fully dressed, was the only member unaffected.

Striking camp early next morning, a collection of eleven *Callosciurus*, eight *Tomeutes* and a gibbon were made on both banks of the river, one of the party collecting as far as Tampao on the west bank was picked up by the boats at noon. At 4 p.m. Rowley and the writer landed on the east bank and walked the rest of the way to Homalin securing two langurs near Kaungkan. McCann with the rafts reached Homalin at 8-30 p.m. Camp was pitched in the compound of the Inspection bungalow where Vernay and Raven were already installed. Here we received an accumulation of mail, Homalin being the northern-most point of call for the Irrawaddy Flotilla steamers. On the 23rd most of the day was spent in going through and re-packing our outfit while in the evening a single *Callosciurus* was collected, nearly white in colour and four bats at night round the bungalow. Collecting was continued on both banks of the river on the following day, the bag from the western bank comprising fourteen specimens of *Tomeutes* and some birds. The scrub jungle in parts seemed to be alive with this species. Quite a large number of coffee trees are grown in the compounds of the houses at Homalin as also in Kaungkan and Kawya. At about 10 p.m. the well-known explorer and botanist, Kingdon Ward, turned up with Tunstell (Mycologist at the Tocklai Tea Station in Assam), having walked through the Naga Hills, and climbed within 2,000 ft. of the summit of Saramathi, the elevation of which is 12,000 ft. Apparently they were unable, for want of time, to climb the last 2,000 ft. but the snow line which was the limit of the forest was reached and here snow was still lying among the rhododendrons which formed the major part of the forest at the higher altitudes. Kingdon Ward and Tunstell, with an escort of twenty Sepoys, and about 120 coolies, reached the Chindwin at Tamanthi having followed the Nantaleik river. They had seen no game and few birds but droppings of either Serow or Goral on the slopes of Saramathi were observed. They spent the next day with us at Homalin. Collections were made during the day on both sides of the river. The *Callosciurus* obtained on the eastern side were nearly white. Successful flashlight photos of the whole party

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were taken in the bungalow late that night. On the 26th morning Kingdon Ward and Tunstell left in a boat downriver. 'Gooming' after dinner, eight 'Tuck-toos' and two tree-frogs were secured. Villagers brought in a small Himalayan bear cub which was taken over by the writer. On the 27th two gibbons were collected in a patch of evergreen jungle bordering a reservoir near Homalin and a further four specimens of 'white' *Callosciurus* were also added to the collection. In the afternoon all our heavy camp kit was put on board the Irrawaddy Flotilla steamer *Namtu* which had arrived. 'Goomers' that night secured two different specimens of civets, *Viverricula* and *Vivera zibetha*.

Homalin is quite a large town, the Headquarters of a Sub-Division Officer, on the eastern bank of the Chindwin, boasting in a number of shops mostly owned by Sikhs. The forest on the east bank is composed of small deciduous trees among which are *Careya arborea, Holarrhena antidysenterica, Feronia, Dillenia pentagyna, Zizyphus, Ficus glomerata* and other species of figs, also *Congea, Bombax, Combretum, Elaeocarpus* and a large species of *Smilax* which was in flower. A number of *Meliaceae* and *Rhamnaceae, Apocynaceae* and *Urticaceae* also occur. In the evergreen patches bordering the reservoir and stream the following were noticed:—*Myrtaceae, Araliaceae, Araceae, Scitaminaceae, Palmae*, and *Pygeum*. The last was fairly abundant and in fruit. The stomach of a female gibbon shot at Homalin contained fifty-four fruits of *Pygeum* entire, while the alimentary canal contained numerous seeds of the same kind. In the swamps grasses, *Cyperaceae, Onagraceae* (*Ludwigia*), a species of a rose (white), and the water hyacinth were common, while a willow (*Salix*) was observed along the banks of the stream. Very extensive paddy fields lie round Homalin; cocoanut, betelnut, plantains and pawpaws are also cultivated. The deciduous forest contained large numbers of a species of *Erythrina*, while a species of *Rumex* was common along the river-banks.

By 8-30 a.m. on the following morning all our light luggage had been loaded on the steamer which left Homalin on the last stage of our journey down the Chindwin river. The steamer stopped at four places to pick up cargo and tied up for the night at Phaunglyin passing during the day several of the quaint native craft known as 'Hoolongs'. As we travelled down-river the forest appeared to become more and more deciduous, *Butea frondosa* showing up in full bloom on the eastern side. The river was very shallow in parts and our boat, a stern-wheel paddle steamer, frequently either stuck on or grated over sandbanks. At this time of the year a passage for the steamers is continuously charted and marked out by bamboos painted either red or black. Owing to this all steamers only travel by day. From here onwards Talipot palms, a number of them in flower, were in evidence near villages. The steamer continued the journey down-river calling at several places *en route* including Pantha, where there is a large oil refinery, and Kindat. At noon we passed some very interesting rock formations. Mawlaik was reached at about 7 p.m. and here we had to change steamers. After breakfast next morning the

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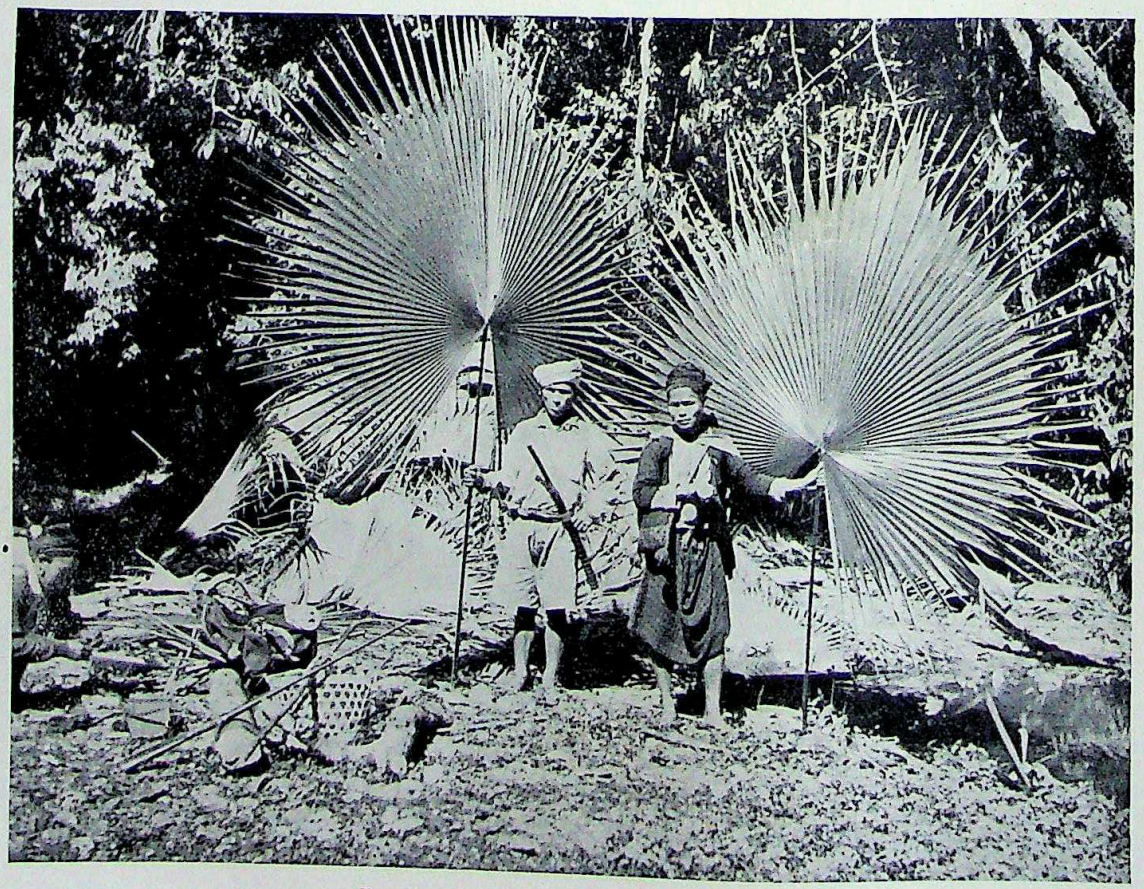
jungle on both sides of the river was visited and four *Callosciurus*, three *Tomeutes*, a *Tamiops*, and several birds were secured. The forests entered were purely deciduous. The following species were common:—*Bombax* sp., *Dillenia pentagyna*, *Randia uliginosa*, *Zizyphus* sp., *Lagerstroemia*, *Elaeocarpus* sp., and some of the *Combretaceae*, *Mimosae* and *Albizzia* also *Butea frondosa*, species of *Ficus*, *Strebulus asper*, *Cassia fistula*, and trees of the *Begnoniaceae*.

The *Callosciurus* collected were unlike *any of those secured hitherto* being dark with rufous tipped tails and a rufous blaze on the forehead, those collected at Homalin being nearly white. The Uyu river joining the Chindwin 3 miles below Homalin apparently forms a barrier to the white squirrel area, the *Callosciurus* on the south and east of the Uyu being more of the type occurring in the interior east of the Chindwin. That night we moved into the larger boat *Sima* which had excellent accommodation and electric lights. The *Sima* was due to travel up river to Pantha, halting at Kindat on the way, and as this provided an opportunity for collecting at Kindat, the writer landed here at 8-30 a.m., and crossed over to the west bank in a dugout with two villagers. During the night while 'gooming' in the Rest House compound a large civet (*Paradoxurus*) was brought down from a fig tree and several 'Tuck-too' lizards caught. Early on the following morning (April 1st) the writer travelled out east, but came to no jungle and hearing the whistle of the steamer had to hurry back, reaching the boat at 7-30 a.m. The villagers informed the writer that there was scrub jungle out further east but that only *Tomeutes* occurred. This was interesting being a complete reversal of conditions, as from Singkaling Hkamti southwards the east bank had been the productive area for *Callosciurus*, the west bank producing mainly *Tomeutes* which were rare on the eastern side. At Mawlaik the east bank again produced *Callosciurus*, only *Tomeutes* occurring on the western side; at Kindat the *Callosciurus* shot on the west bank was dark grey with a grey white tail and chestnut underparts. McCann collected a *Callosciurus* on the east bank at Pantha, similar to the specimen secured at Mawlaik. A number of 'Tuck-too' lizards had also been collected and a leopard cat unfortunately lost.

McCann records that the forests on the eastern bank at Pantha are dry and deciduous except along the banks of streams where evergreen trees occur, the deciduous forests being composed chiefly of the following trees and shrubs:—*Tectona grandis*, *Elaeocarpus* sp., *Gmelina arborea*, *Careya arborea*, *Bassia* sp., *Odina woodiar*, *Butea frondosa*, *Calycopteris floribunda*, *Woodfordia fruticosa*, *Ficus* sp., *Eugenia* sp., *Randia* sp., and a tree of the *Papilonaceae* with a purple-bloom. *Gliricidia maculata* was also common.

The civet (*Paradoxurus*) collected at Kindat contained five foetuses. Halting at Mawlaik for a short time the steamer arrived at Kalawa soon after 4 p.m. and here six *Callosciurus* were secured, mostly in the compounds of the houses in the village on the eastern bank, also 11 *Tomeutes* on the western bank. The *Callosciurus* were of the same type as collected at Mawlaik and Pantha. The *Tomeutes* were apparently feeding on the fruit of *Calycopteris*

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Leaves of a Palm (*Livistona* (?) sp.).

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floribunda. In front of nearly every Burmese and Shan house in these towns and villages stands a long pole headed with a plaited bamboo mat, about 18 in. square, and a crook: apparently it is an unwritten law that one of these has to be maintained in front of every house to beat out fires and pull out burning materials.

Leaving Kalawa at 5 a.m. in the morning the steamer reached Okina on the eastern bank at 4-30 p.m. calling at several villages *en route*. In the evening squirrels and some birds and frogs were collected and after dinner 14 'Tuck-toos' and seven nightjars. The giant squirrels (*Ratufa*) were different to those shot previously being much lighter in colour and smaller. We were now in the typical dry zone of Burma and much of the scrub jungle is similar to that occurring in the dry parts of South India. Leaving at 5 a.m. next morning we arrived at Monywa at 1-30 p.m. and so completed our journey down the Chindwin river and our collection work. Our train left Monywa early next morning, and travelling most comfortably in a special reserved carriage, we arrived at Rangoon on the morning of April 5th, and were met by Hopwood.

Our collection consisted of some 1,000 mammals, 750 birds and a large number of reptiles and fishes. The most interesting side of the collection was definitely the squirrels (*Callosciurus*) which exhibited a remarkably interesting variation in colouration of coat. Those collected on the eastern side of the Chindwin showed the most interesting changes, while the specimens of *Callosciurus* collected on the western side remained far more constant. It is suggested that an explanation for the variety of colour displayed east of the Chindwin might possibly be found in an examination of the flora in the different localities producing the different colour forms. In the dense forest of the northern areas the colouration was definitely darker than those in the lighter deciduous forest further south, continuing down to Homalin, where the *Callosciurus* were almost white. McCann observes that in studying the vegetation it would be necessary to take into consideration the colouration of the bark of the trees and the predominance of either dark or light coloured vegetation, and it would be also necessary to study this in connection with the rainfall figures of the various places. At the time the expedition visited the area the squirrels were observed to be feeding on *Elaeocarpus* sp., and *Pterospermum* sp. An examination of the embryological material collected by Raven would provide interesting information on the breeding season of those animals.

The writer cannot conclude these notes without expressing his obligation to McCann for his notes, of which he has made full use. The botanical notes in this article are almost entirely quoted from his notes as also the opinion expressed on the possible bearing the vegetation in the various localities has on the variation in colouration exhibited by specimens of *Callosciurus* collected east of the Chindwin down to Homalin. The writer cannot but observe however that one obvious hitch to this theory is provided by the colouration of the *Callosciurus* collected south of Homalin which appear to be a definite throw-back to that of specimens collected in the denser jungles of the interior up north, west of the Uyu river.

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THE VERNAY SCIENTIFIC SURVEY OF THE EASTERN GHATS.

(Ornithological Section).

BY

Hugh Whistler, m.b.o.u., assisted by N. B. Kinnear, m.b.o.u.

Part XIV.

(*Continued from page 437 of this volume*).

Crocopus phoenicopterus chlorogaster (Blyth).

Vinago chlorogaster Blyth, J.A.S.B., vol. xii (1843), p. 167, note—no locality, now restricted to Salem district in South India.

Specimens collected:—144 ♂ 28-4-29 Kurumbapatti; 1022 ♂ 22-11-29 Nallamalai range 2,500 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	20-22.5	182-184	100-108.5	24.5 mm.

There is very little definite information about the status and distribution of the Southern Green Pigeon in the Presidency. On the eastern side the above two records are merely supplemented by Dewar's statement that it is not at all common at Madras.

On the west I find the following records. A male in the British Museum was collected by William Davison on 17 February 1881 three miles beyond Seegore (Sigur). There is a male from Malappuram dated 7 April 1912 in Colonel Sparrow's collection.

In the Nelliampathies according to Kinloch the Green Pigeon is very common and locally migratory. He says (*J.B.N.H.S.*, xxvii, 943) that it comes up from the plains towards the beginning of October and in November and December may be found everywhere. Towards the middle of January they start disappearing, presumably going back to the plains and they gradually diminish in numbers till the middle of February when the last stragglers depart. Occasionally a few birds remain in the Nelliampathies till the burst of the S.-W. Monsoon and breed in the hills.

In the Palnis this Green Pigeon appears to be confined to the base. Fairbank says that he obtained it in the avenues of the north base in October 1866 but did not find it at all on his second visit, which suggests that here too there may be local movements. Terry, however, took a fresh egg in the Pittur Valley on 7 April but found the bird no higher up.

Stewart is said to have taken eggs in Travancore in January (*Nidification*, iv, 127) but the species does not occur in Ferguson's list.

It may be remarked that the few specimens I have examined from the Presidency appear to be smaller than the specimens of *chlorigaster* which occur across the central belt of the Peninsula, where males have a wing varying up to 203 mm. in size.

The *Vinago chlorigaster* of Blyth was originally described without any type locality. In the *Annals Mag. Nat. Hist.* 1844, vol. xiv, p. 116, Blyth, however, says in the Birds of Calcutta:—'that of Southern India (*Vinago* or *Treron*) *chlorigaster* nobis I have only once obtained in this part and have received specimens of it from Mr. Jerdon and others.' This clearly fixes the type locality as Southern India and I now further restrict it to Salem district.

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Dendrophassa pompadora affinis (Jerdon).

Vinago affinis Jerdon, Madras Jour. Lit. Sci., vol. xii (1840), p. 13—West Coast of India.

The Grey-fronted Green Pigeon was not obtained by the Survey and it is confined to the west coast of India from the extreme south up to, not only North Kanara as given in the *New Fauna* (v, 188) but to Alibag (Sinclair, *J.B.N.H.S.*, xii, 185) and Khandala (Fairbank, *S.F.*, iv, 261) as correctly given in the *Old Fauna*.[1] In this area it is of course a resident species though it moves about locally in accordance with the ripening season of the berries and fruits on which it feeds. The statement that it occurs in the Laccadives is surely an error for Pigeon Island (see Hume, *S.F.*, iv, 424).

In Coorg, according to Betts, large flocks come into the coffee estates from September to Christmas but spend the rest of the year in the jungle. There are two specimens from Coorg in the Tweedale collection as well as two from Calicut. In the Wynaad William Davison obtained a series now in the British Museum and he says that it is found in small flocks in different parts, though nowhere very abundant. It does not ascend the Nilgiris to any height, but is fairly common up to 3,500 ft. On the north side Phythian Adams saw it occasionally at Musnigudi and saw several flocks at Anaikatti 3,000 ft. in September and October.

Kinloch found this Green Pigeon extremely common in the Nelliampathies in February and March but says that it descends to lower levels before the burst of the S.-W. Monsoon. In the Palnis Fairbank obtained it at Periur, where it was coming in flocks to feed on the ripening fruit of *Zizyphus*.

In Travancore this Pigeon is common in the jungles both in the low country and on the hills at low elevations. They ascend higher in February and March, then occurring up to about 3,000 ft.

The breeding season in the Presidency is from January to April. Darling took several nests on the 10th April at 3,000 ft. at the foot of the Terriat hills, 10 miles N.-W. of Vythery, S. Wynaad (*N. & E.*, ii, 375). Phythian Adams took eggs at Anaikatti in February. In the Nelliampathies Kinloch found them breeding almost solely in January and February (*Nidification*, iv, 130). Bourdillon took an egg in the Ashambo Hills on February 24th.

Dendrophassa bicincta bicincta (Jerdon).

Vinago bicincta Jerdon, Madr. Jour. Lit. Sci., vol. xii (1840, after September 22), p. 13—sea coast, south of Tellicherry.

Specimens collected:—1635 ♂ 31-3-30, 1640 ♂ 1-4-30 Sankrametta 3,500 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	19	161-164.5	98.5	20 mm.

The Orange-breasted Green Pigeon appears to be fairly generally distributed on both sides of the Presidency though very little is really known about it. Jerdon obtained a female, the type of his *Vinago unicolor* (which he did not then recognise as the female of his *Vinago bicincta*), in a grove of trees at Bimlipatam on the sea coast, not far from Sankrametta where the Survey specimens were obtained. He also states in the Illustrations that he had obtained specimens from the Eastern Ghats west of Nellore and once in the 'Carnatic'.

For the west William Davison (*S.F.*, x, 406) records that he once saw a specimen shot at Cherambady in the Wynaad by a Mrs. F. Hodgson. In Travancore, according to Ferguson, this bird may be met with in the low country not far from the coast.

Nothing is recorded about the breeding season in the Presidency.

There are evidently two races of the Orange-breasted Green Pigeon in India and Ceylon distinguished merely by size. Ceylon birds are very small. 9 males measure: bill 17-19, wing 145-154, tail 88.5-93.5 mm. Himalayan birds, on

[1] Since the above was written I see that Mr. Humayun Abdulali has recorded the species from Karnala Fort, Kolaba District on 25 February 1934. *J.B.N.H.S.*, xxxvii, 955.

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the other hand, are large and with them must be grouped our Survey birds, and birds from N. Kanara, 6 ♂ measuring bill 16-19, wing 156-164.5, tail 93.5-98.5 mm. There are however unfortunately no birds available from the Malabar Coast to show what is the typical race, whether it agrees with either the large or the small form, or is intermediate between them. Mr. Stuart Baker tries (*New Fauna*, v, 190) to settle the question on the three specimens with no precise locality collected by Jerdon and Baker (wrongly called Baber) in the British Museum. This however is valueless as there is nothing to show whether Jerdon's birds were collected from his northern or southern localities and there is no reason to believe that Baker collected in Ceylon as alleged by Mr. Stuart Baker. There also seems to be no proper evidence for the statement (*Nidification*, iv, 131) that birds from South Travancore belong to the small Ceylon race.

The Malabar birds must of course be the typical race. There are names available both for the northern and southern (Ceylon) birds. For the former *Vinago unicolor* Jerdon, Madras Jour. Lit. Science, vol. xii, 1840 (after September 22), p. 13—Bimlipatam. For the latter *Treron bicincta leggei* Hartert, Novitates Zool., vol. xvii (1910), p. 193—Ceylon. When Malabar specimens are available the correct names and distributions of the races can be settled.

Ducula badia cuprea (Jerdon).

Carpophaga cuprea Jerdon, Madr. Jour. Lit. Sci., vol. xii (July 1840), p. 12—Wynaad.

Not procured by the Survey. There is a very doubtful record of Jerdon's Imperial Pigeon in Jeypore State (Ball, *S.F.*, v, 418) which supplies the only suggestion that it occurs anywhere in the Eastern Ghats. On the west it is well known. Colonel Baker (*Birds of S. India*, p. 277) has an interesting account of how he met with it at Wotacolly in Coorg, finding it common almost to the foot of the western slopes, though he had not observed it at all on the eastern side of the Ghats. William Davison called it not uncommon in the great forests of the Wynaad and on the slopes of the Nilgiris where Mr. Betts informs me they occur up to about 4,000 ft. Jerdon (*Birds of India*, iii, 458) has something to say about the local migration of the birds from Coorg and the Wynaad, from the middle of April to the first week of June, to the neighbourhood of Cannanore, to feed in a large salt swamp but this swamp now seems to have disappeared.

Kinloch found it very common in the Nelliampathies.

In Travancore Jerdon's Imperial Pigeon is common in the hills in heavy forest at all elevations and a series from Mynall is in the British Museum. A specimen collected in May 1917 by Mr. S. H. Prater in Madura (doubtless in the High Wavy Mountains see *J.B.N.H.S.*, xxv, 290) is in the Society's collection.

Bourdillon was of the opinion that the bird was double-brooded laying in April and again in November, but Stuart Baker (*Nidification*, iv, 139) on the authority of Stewart gives the breeding season as from January to May in Travancore. It is doubtless much the same in Coorg and the Wynaad as Iver Macpherson (*N. & E.*, ii, 368) took eggs in March, April and May, just over the border in Mysore territory.

Muscadivora aenea pusilla (Blyth).

Carpophaga pusilla Blyth, *J.A.S.B.*, vol. xviii (1849), p. 816—Nilgiris.

Specimens collected:—14 ♀ 10-4-29 Kurumbapatti; 291 ♂ 30-5-29 Chitteri range 2,000 ft.; 652 ♂ 4-8-29 Palkonda Hills 1,000 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	27-28.5	211-218	139-140	29 mm.
1 ♀	27	202	131	28 mm.

The Green Imperial Pigeon seems to be very generally distributed in small numbers in the Presidency. Ball (*S.F.*, v, 418) tells us that it was found by Captain Blaxland at Paparhandi 1,800 ft., a town in the Jeypore Agency. A male obtained north of Ellore on 6th April 1871 is in the Hume collection and a specimen from Vellikonda, Nellore district, is in the Madras

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Museum. On this side the records are completed by the two Survey specimens.

For the west there are a male (2 October 1867) and a female (17 October 1867) from Kullar and an unsexed bird collected at Calicut in 1873, all in the Hume collection. There seem to be no records for the Nilgiris but Major Phythian Adams informs me that he obtained it in July near Kollegal (North Coimbatore) though there were not many about.

In the Nelliampathies it is rare and only occurs, according to Kinloch, towards the foot of the southern slopes.

In Travancore Ferguson says it is only found in forest in the low country. He had never seen it in the hills or away from the coast.

According to Stuart Baker (*Nidification*, iv, 142) eggs have been taken in Travancore by Bourdillon and Stewart from February to April and in June.

In the *New Fauna* (v, 209) Mr. Stuart Baker says that there is a vast area between North and South India where no Green Imperial Pigeons occur. This is not quite correct. I have plotted all the records on a map and find that they extend in an unbroken line from the Eastern Himalayas to Travancore mostly confined to the eastern side, but on the west also occurring up as high as Bombay. In this wide Indian distribution and in Ceylon there is no variation in colour but there is a gradual increase in size from the south to the north. The series available is not properly sexed but the difference in size between Himalayan and Cinghalese birds is considerable:—

	Bill.	Wing.
6 birds Eastern Himalayas	30.5-33.5	232-248 mm.
6 birds Ceylon	29-32	202-213 mm.

This difference is bridged by degrees by the specimens available from the intermediate areas and it does not seem possible to say where one race begins and another ends. Under the circumstances I propose to use the arbitrary boundary of the twentieth degree, which has been already used in a number of similar cases. All Presidency birds may then be known as *M. æ. pusilla* while for the northern birds the name available is *Columba sylvatica* Tickell, J.A.S.B., vol. ii (November 1833), p. 581—Borabhum.

Mr. Stuart Baker has wrongly given the type-locality of *M. æ. pusilla* as Ceylon instead of the Nilgiris and his argument (*loc. cit.*) is affected by this mistake.

Chalcophaps indica indica (Linnaeus).

Columba indica Linnaeus, Syst. Nat., ed. x, vol. i (1758), p. 164—In India orientalie.

Specimens collected:—357 ♀ 7-6-29, 374 ♂ 9-6-29 Chitteri range 2,000 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	22	146.5	94.5	25 mm.
1 ♀	21.5	147	91	24 mm.

The Bronze-Winged Dove is better known in the Presidency on the western side. Although normally a forest bird Mr. Betts tells us that in Coorg it is occasionally seen in the well-wooded coffee estates. It occurs in fair numbers according to William Davison in the Wynaad and over the lower slopes of the Nilgiris, ascending in smaller numbers as high as Coonoor on the one side and Neddivattum on the other. Major Phythian Adams informs me that it may often be seen on the Goodalore Ghat. There is a specimen (♂) from Malappuram dated 9-6-12 in Colonel Sparrow's collection.

Kinloch called it very common in the Nelliampathies. In the Palnis Fairbank shot one and saw another at Periur, and Terry obtained a specimen at Pulungi. In Travancore, according to Bourdillon, this bird is common on the hills at all elevations in the dry weather, but at other times is confined to the lower slopes.

On the eastern side the Bronze-winged Dove was found in Panapakkam Forest Reserve, Chittoor district, by Dawson (*J.B.N.H.S.*, xxvi, 671) when a female was shot on 13 February 1919 and two other birds seen. There is a specimen from the Shevaroys in the Madras Museum a locality confirmed by the two specimens collected by the Survey. Mr. LaPersonne reports that the birds were common.

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Streptopelia orientalis meena Sykes.

Columba meena Sykes, P.Z.S. 1832 (November 22), p. 149—Dukhan.

Although no specimen of the Rufous Turtle-Dove was obtained by the Survey I have thought it desirable to go into the whole question of the distribution and names of our Indian races in view of the different views which have been published on the point and in order to identify the only Presidency specimen available for examination.

There are four difficulties in the matter—so far as our Indian birds are concerned—the lack of reliable information as to where these doves are to be found as breeding birds, the lack of specimens of known breeding birds, the intergradation between the three races, and finally the correct attribution of the available names.

There is no difficulty—save of name—for the bird which breeds as a summer visitor at moderate and high altitudes throughout the Western Himalayas. This is the bird with pale underparts, much white on the belly and white under tail-coverts and white tips to the tail feathers. On its breeding there is plenty of accurate information and there are many specimens available which from their dates and other information may be satisfactorily accepted as breeding birds. As this race is highly migratory its breeding season is well-defined. In winter it vanishes from its breeding territory and moves southwards and eastwards, avoiding however the desert areas of Sindh and Rajputana. Specimens in the British Museum verify its occurrence far south in fair numbers in Western Khandesh (Davidson, *S.F.*, x, 315) and also occasionally at Mahableshwar (♀ May 1874, Fairbank), N. Kanara (♂ 14-3-89, Sirsi James Davidson), and Manantoddy, Wynaad (sex? 10-4-1881, William Davison). Eastwards I have examined specimens from Seoni (♀ 4-3-70 Hume coll.), Mirzapur (sex? March 1869, Thompson), Darbhangha (♂ 8-10-07 Baghownie, ♂ juv. 2-12-03 Anarh, Inglis), and Native Sikkim (♂, sex? April 1874, Mandelli).

The eastern limit of this bird's breeding range is not satisfactorily established. The *Old Fauna* (iv, 42) says that it breeds as far east as Sikkim. Mr. Stuart Baker says (*New Fauna*, v, 240) 'The Himalayas as far east as Western Nepal and then through the lower levels to Sikkim up to 8,000 ft., above which the preceding bird [*orientalis orientalis*] takes its place.' This he amplifies in *Nidification* (iv, 160) by saying that in Sikkim, Stevens saw and obtained birds in early summer at 4,500 ft. though they were not then breeding. There is something wrong about the latter statement as Stevens says very clearly (*J.B.N.H.S.*, xxx, p. 885) that he had failed to meet with this form at all in the Sikkim Himalaya. I cannot find any authority at all for the breeding of this form in the Sikkim Himalaya and both editions of the *Fauna* are manifestly relying on Hume's statement (*N. & E.*, ii, 349) which was perhaps based on the two Mandelli (April) skins. Hume in writing of the Rufous Turtle-Doves appears to have departed from his usual care, for his account of the breeding range in continental India was also evidently written without satisfactory evidence.

My own view is that as a breeding bird this race is confined to the Western Himalayas, and that in Nepal it intergrades into the richly coloured form which is common in Sikkim and the Duars. Scully's account of the Rufous Turtle-Dove in Nepal* (*S.F.*, viii, 340) shows clearly that the bird is found as a breeding species and also as a passage migrant from August to December and again in March and April. This is borne out by the series of Scully and Hodgson skins in the British Museum which clearly fall into two groups. One group are typically pale birds, like those of the north-west. Such of these as bear dates were collected in October, November and December and doubtless represent the passage birds of Scully's account. The remainder are intermediate between the west and east Himalayan* forms, the pale and the richly coloured and, in my opinion, represent the breeding bird as in several cases Scully has recorded the organs as greatly enlarged. Stevens (*loc. cit.*) describes a breeding pair from the Mai Valley, E. Nepal as intermediate. I am aware of course that Inglis has recorded the pale north-western bird as breeding in Mahdubani subdivision, Bihar (*J.B.N.H.S.*, xiv, 502), but his account suggests that the occurrence was unusual and it is possible that a critical examination of the birds would have shown that they were also intermediate.

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As to the breeding season Mr. J. Darling found a nest with two young ones at Vythery on 7 March 1873 (*N. & E.*, ii, 364). In the Nelliampathies according to Kinloch and in Travancore according to Bourdillon this dove breeds in April and May and again in November and December (*Nidification*, iv, 147). Bourdillon also records two hard-set eggs on January 13th.

There is no difference between birds from North and South India. Ceylon birds are, however, separable as *Chalcophaps indica robinsoni* Stuart Baker on the characters given in the *New Fauna*.

Columba livia intermedia Strickland.

Columba intermedia Strickland, Ann. Mag. Nat. Hist., vol. xiii (January 1844), p. 39—India.

Not reported by the Survey. The Blue Rock Pigeon is evidently much less common and less generally distributed in the Madras Presidency than in Northern India, though I am not sure how far the records convey a true picture of its distribution. On the eastern side it is only recorded in Dewar's list for Madras. On the western side we have two specimens marked Coorg in the Tweedale collection. It may be remarked however that the bird is not included in Bett's Coorg list and these specimens are not altogether satisfactory, being indistinguishable from North Indian birds.

The Blue Rock Pigeon is not included in William Davison's Wynaad and Nilgiri list but two males collected at Coonoor by him on 4 November 1881 and 25 October 1881, that is after the trip whose results are recorded in his paper, are in the British Museum.

In the Palnis Fairbank met with a flock by 'the fall of Levinge's brook' and Terry found a large colony on the cliffs near Pittur. In Travancore, according to Ferguson, this pigeon is common in the low country, frequenting paddy fields. During the dry months these flocks ascend the hills in South Travancore to an elevation of 2,500 ft., feeding up there by day and returning at night to roost in the plains. There is a large colony on a sea-girt rock off Cape Comorin.

Nothing is recorded about the breeding season in this Presidency. The small amount of material from South India for the critical study of this pigeon is far from satisfactory but it appears that the Blue Rock Pigeon is darker and smaller in South India (*intermedia*) and larger and paler in North India (*neglecta*), the two forms grading into each other. Until proper material is, however, available from Central and South India any attempt to define the distribution of the two races is premature.

Columba elphinstonii (Sykes).

Ptilinopus elphinstonii Sykes, P.Z.S. 1832 (November 22), p. 149—Ghauts.

Not met by the Survey. Except for the unconfirmed and unlikely report of its occurrence in Jeypore (Ball, *S.F.*, v, 418) and the statement in the *Birds of South India* (p. 281) that it occurs in the Shevaroys, the Nilgiri Wood Pigeon is only found in the Presidency in the western hills. William Davison reported it as comparatively common in the Brahmagherries. The Wynaad is not high enough for it but in the Nilgiris it is common from about 4,000 ft. upwards, being usually found in pairs though numbers may collect when the fruits of various trees are in season. Its numbers and its movements evidently depend very greatly throughout its range on the berries and fruits on which it feeds. Colonel Sparrow's collection contains a female collected at Kolattur, Malappuram, on 9 December 1912.

This Pigeon does not occur in Kinloch's Nelliampathy list but in the *Birds of S. India* he is quoted as saying that it is found sparsely in those hills. Southwards it is common in the Palnis, from 4,000 ft. upwards, and in all the higher ranges of the Travancore hills. Mr. Prater obtained a specimen, now in the Society's collection, in the High Wavy Hills of Madura on 14 May 1917.

Mr. Stuart Baker (*Nidification*, iv, 154) states that the breeding season in the Presidency lasts from March to July, most eggs being laid in May and June.

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Streptopelia orientalis meena Sykes.

Columba meena Sykes, P.Z.S. 1832 (November 22), p. 149—Dukhan.

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To return to the East Himalayan bird. This as I have already stated is very richly coloured with the white of the previous form replaced by grey. It is very close to *S. orientalis orientalis* (Manchuria, Korea, Japan and Tibet) and the *Old Fauna* indeed included both as one form. It may have however been separated from the typical race as more richly coloured, but it certainly grades into it on the one side and into the pale north-west bird on the other. The exact attribution of many specimens to one form or the other is quite impossible.

This richly coloured form—by whatever name it is to be known—is said by Mr. Stuart Baker to breed in Sikkim and the Assam Hills and Burma, though I have not been able to examine any skins known with certainty to be of breeding birds. This form was also believed by Hume to breed in the 'broken belts of hills and forests that stretch across the continent of India from the northern portion of the Western Ghats to Cuttuck' (*N. & E.*, ii, 350) but as regards their breeding in this area the only evidence seems to be Blewitt's account of its breeding in great numbers in Sambalpur.

This bird certainly occurs at Khandala, Mahableshwar, and in N. Kanara on the Western Ghats and at Seoni from all of which places there are specimens in the British Museum. Whether it breeds in these places is hard to make out, as though the skins are dated March, April and May these months in this area might agree with breeding or migration. At Mahableshwar, Fairbank (*S.F.*, iv, 262) says it occurs in the cold season. In North Kanara James Davidson (xii, 62) found it common from November to April and doubted whether it bred. Other records from this area e.g. Satara (Davidson & Wenden, *S.F.*, vii, 86) and Belgaum (Macgregor, *S.F.*, x, 440) throw no light on its status except that it is common.

I feel that until satisfactory evidence of breeding in the Western Ghats is produced it is wiser to consider that both the pale and the richly coloured forms are winter visitors to this area. One thing I feel certain of however, that the birds examined from the Sambalpur, Raipur, Seoni and Western Ghats localities belong to the richly coloured form and not to the typical race which Mr. Stuart Baker says (*New Fauna*, v, 239) 'in winter occurs over the greater part of Eastern India as far west as the Deccan and possibly the Bombay Presidency but, in the north, not west of the United Provinces'. It is not easy to separate the typical race and the richly coloured form while many specimens might belong to either, but I am far from satisfied that the typical race occurs in India at all; at any rate no specimen that I have examined from India proper can, in my opinion, be definitely referred to it.

With regard to the correct names for these Indian forms I do not feel the difficulties which have oppressed certain writers. The oldest name *orientalis* is generally accepted for the Chinese and N. Asiatic bird. The next oldest name is the oft-debated *Columba meena* of Sykes. Kinnear (*Ibis* 1934, p. 97) has recently given the full details of the situation regarding this name. It is evident that Sykes obtained both the pale bird of the north-west and the richly coloured bird of the north-east, which as I have shown, both occur in winter in the area which he was working. The former he took for the male, the latter for the female. The mistake does not invalidate the name which must be used for the supposed male, which comes first in the description and as it was the bird with the white tips to the tail feathers, the name *meena* will stand for the pale bird which breeds in the North-Western Himalayas. The next oldest name in the synonymy of the Rufous Turtle-Dove is *Columba agricola* Tickell, J.A.S.B., vol. ii (November 1833), p. 581—Jungles of Dholbhum and Borabhum.

The description is poor but obviously refers to some form of Rufous Turtle-Dove and as we have at present evidence as to the occurrence of only one form—the richly coloured bird of the north-east—in this area the description and name may be safely taken as applying to it.

There are very few records of the Rufous Turtle-Dove in the Presidency. Jerdon says that he procured it in Goomsoor and in the Bamboo jungles of the Eastern Ghats. There is a specimen from Chingleput in the Madras Museum and another in the British Museum collected by William Davison on 10-4-1881 at Manantoddy in the Wynaad. The last specimen is, as mentioned above, the pale bird of the north which in future I propose to call *S. orientalis meena*. The other records however are more likely to refer to

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S. o. agricola and the Madras Museum bird was labelled from the *Old Fauna Turtur orientalis* under which *agricola* was then included.

Streptopelia chinensis suratensis (Gmelin).

Columba suratensis Gmelin, Syst. Nat., vol. i, pt. ii (1789), p. 778—Surat.
Specimens collected:—160 ♀ May 1929 Kurumbapatti; 277 ♀ 24-5-29 Shevaroy Hills 4,000 ft.; 403 ♀ 13-6-29 Chitteri range 3,000 ft.; 771 ♂ 28-8-29 Palkonda Hills 1,000 ft.; 911 ♂ 12-10-29 Seschachalam Hills 2,000 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	19-20	141-142	128.5-131	21-21.5 mm.
3 ♀	19-20	132-137	117-124	20-22.5 mm.

I can find no record of the Spotted Dove in the eastern side of the Presidency north of the Godavery Valley. With that exception—which probably does not exist in fact—the Spotted Dove is evidently generally distributed and common throughout the Presidency from sea-level up to a height of about 4,000 ft. and there appears to be no need to quote individual records, though Jerdon's remark that it is rare on the bare Carnatic tableland suggests that there may be local patches of country unsuited to its needs. In the Nilgiris it is said to be common up to about 4,500 ft. and scarce above that height except in the highly-cultivated area between Coonoor and Ootacamund. In the higher Travancore Hills Ferguson considered it a dry weather visitor only.

In the Nilgiris the breeding season is given by Miss Cockburn as March and April, but Cardew says that it breeds from February to September (*N. & E.*, ii, 356). In Travancore Bourdillon gives the breeding season as between April and September.

The Spotted Dove is slightly variable in colour and in the amount of spotting on the back and tertiaries, and south Indian birds average a few millimetres smaller in size. It is not, however possible to divide the birds into two races in India proper. Ceylon birds are definitely smaller and have been separated by Reichenback (Vollst. Naturg. Tauben, pl. 253 b, figs. 3373-3374, 1851) as *ceylonensis* and this race may be maintained, as the following measurements show:—

15 ♂ India (north and south)	135-146.5 mm.
9 ♀ India (north and south)	132-142.5 mm.
5 unsexed, Ceylon	127-133.5 mm.

The three Travancore birds examined (wings 134.5, 138.5, 139) belong to the continental form.

Streptopelia senegalensis cambayensis (Gmelin).

Columba cambayensis Gmelin, Syst. Nat., vol. i, pt. ii (1789), p. 779—Surat.
Specimens collected:—1068 ♂ 9-12-29, 1082 ♂ 10-12-29 Cumbum Valley.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	17	121-128	106.5-111	18-18.5 mm.

The Little Brown Dove occurs sparingly on the tableland of the Nilgiris according to William Davison and a few can always be obtained about the Badaga cultivation. Mr. Betts considers that they usually go down to the Mysore plains to breed as they are seldom to be seen in the Nilgiris between April and September.

Fairbank observed it at the base of the Palnis and in the lower hills and Terry specifies that he saw it on the slopes below Pulungi and in the Pittur valley, though it was not common.

In Travancore it is said by Ferguson to be confined to the dry patch of country about Cape Comorin.

On the eastern side there are very few records of the Little Brown Dove—namely the two Survey specimens, Dewar's inclusion of it without comment on his Madras list and Salem. In this last locality Theobald obtained a nest with two eggs at the railway station on August 15th (*N. & E.*, ii, 351). Both the Cumbum Valley birds had the organs much enlarged.

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The two males obtained have wings 121-128 mm. and three males in the British Museum from Sigur and Bandipur, close by in Mysore, have wings 125-131 mm. Seven males measured from the Punjab have wings varying from 126-135.5 mm. There is no difference in colour and it is obvious that all Peninsular Indian birds must be kept in the one subspecies.

Streptopelia decaocto decaocto Frivalszky.

Columba risoria var. *decaocto* Frivalszky, A. M. Tarsasag Evkonyvei 1834-36, Bd. iii, Teil 3 (1838), p. 183, pl. viii—Turkei.

Not procured by the Survey. The Indian Ring-Dove appears to be far less common in the Presidency than in other parts of India. On the eastern side it is only recorded by Dewar who includes it in his list without comment.

On the west William Davison says that it is not uncommon about Seegore (Sigur) in the Nilgiris and a male collected by him near there on 18 February 1881 is in the Hume collection. He also adds that many years previously he shot a specimen on the plateau about 7 miles from Ootacamund but this was the only specimen he had found at that elevation.

Fairbank found it in the plains near the Palnis and Terry met with it in the Pittur Valley, but both observers remark that it is not particularly common.

In Travancore Ferguson says it is only to be met in the dry region of the far south, round about Cape Comorin.

There is no information about the breeding season in the Presidency though the bird is presumably a resident. No difference in size or colour exists between the birds of Northern and Southern India.

As Hartert explained (*Nov. Zool.*, xxiii, 1916, pp. 78-80), the time-honoured name *Columba risoria* Linnaeus cannot really be used for the Indian Ring-Dove as it was definitely given to the domesticated dove. This bird is of uncertain origin but may be derived from the African *Streptopelia roseogrisea*.

Oenopopelia tranquebarica tranquebarica (Hermann).

Columba tranquebarica Hermann, Observ. Zool. (1804), p. 200—Tranquebar.

Specimens collected:—1138 ♂ 18-12-29, 1145 19-12-29, Cumbum Valley.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	17-17.5	138.5-141	89-90	17-18 mm.

Both the specimens of the Red Turtle-Dove collected by the Survey had the organs greatly enlarged and therefore presumably were breeding. These specimens provide the only records for the Presidency except for Dewar's inclusion of the species without comment in his Madras list and for the type locality Tranquebar.

I do not think it is worth recognising the intermediate subspecies *murmensis* for birds from the Eastern Himalayas and Assam. The two races *tranquebarica* and *humilis* (type locality Bengal), even when extremes from N.-W. India and the Philippines are compared, are far from being as distinct in colour as the *New Fauna* makes out and the colour of the axillaries may be variable. Many individuals certainly cannot be separated. The intermediate race could therefore only be identified by reference to locality.

Pterocles indicus (Gmelin).

Tetrao indicus Gmelin, Syst. Nat., vol. i, pt. ii (1789), p. 755—Coromandel Coast.

Jerdon's statement that the Painted Sandgrouse occurs in the Carnatic doubtless refers to the neighbourhood of Madras city as there are specimens from Madras and Arkonam near Vellore in the Government Museum. A male obtained at Madras in 1876 by Wardlaw-Ramsay is in the British Museum.

It also occurs just inside the Presidency boundary at Anaikatti 3,000 ft. on the northern slopes of the Nilgiris. Here it is found in pairs or small parties of 6 to 8 birds but is not common (Phythian Adams, *apud Birds of S. India*, p. 289).

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Pterocles exustus ellioti Bogdanow.

Pterocles ellioti Bogdanow, Mél. Biol. (Bull. Ac. Sci. Petersb.), xi (1881), p. 54—Eritrea, Southern Abyssinia.

The only definite record of the Common Sandgrouse in the Madras Presidency which I have been able to trace apart from Hume's general statement (*Game Birds*, i, 69) that it occurs in the northern and central portions is that by Blanford (*Old Fauna*, iv, 61) 'I have seen many and shot some a little north of the Cauvery near Trichinopoly.' Mr. Stuart Baker (*Game Birds*, ii, 297) states that he has received eggs from Travancore and this no doubt refers to the dry country round Cape Comorin.

Captain C. H. B. Grant who has been working at the races of this species kindly informs me that the above is the correct name of our Indian bird.

Pavo cristatus Linnaeus.

Pavo cristatus Linnaeus, Syst. Nat., ed. x, vol. i (1758), p. 156—India.

The only detailed information about the status of the Peafowl in the Presidency comes from the western side. Here in Coorg it is common in the scrub jungle on the Mysore frontier (Betts). It occurs locally throughout the Wynaad and on the slopes of the Nilgiris up to 4,000 ft. (Davison). Jerdon says it occurs up to 6,000 ft. in the Nilgiris but Hume doubts this (*Game Birds*, i, 82) though he knew of its occurrence as high as Cook's Hill 5,000 ft. Normally it does not breed in the Nilgiris above 2,000 ft. according to the latter. Major Phythian Adams informs me that it is common at Anaikatti and Colonel H. R. Baker (*Birds of S. India*, p. 294) says that it is common at Musnigudi on the Seegore (Sigur) Ghat and also at the foot of the Wynaad Ghats in the Nilambur Valley.

Fairbank observed it at the northern base of the Palnis, in which hills according to Hume (*loc. cit.*) it does not occur over 3,000 ft. As regards Travancore Ferguson states that it was at one time common at the foot of the hills in South Travancore though at that time no longer so: also found on the hills about Pirmeed.

From the eastern side I have no information whatever beyond the fact that the Survey met it in the Salem district in thick dry forests with a liberal sprinkling of boulders and cactus.

Miss Cockburn (*N. & E.*, iii, 407) says that eggs are to be found in the Nilgiris in June and July.

Gallus gallus murghi Robinson and Kloss.

Gallus ferrugineus murghi Robinson & Kloss, Records Ind. Mus., xix (1920), pp. 14-15—Chirala, Gya district, Bihar.

The Red Jungle Fowl is confined in the Presidency to the north-east corner and its range in this area is thus defined by Hume (*Game Birds*, i, 217):—it occupies the whole country north of the Godaveri, Orissa, the Tributary mahals, Ganjam, Vizagapatam and part of the Godaveri district, Joonagurh, Kareall, Nowagurh, Jeypore and other Feudatory States. Jerdon says that he even heard of its being killed south of the Godavery at Cummum, though he was not certain of the correctness of the statement. Jerdon declared it to be very abundant in the Northern Circars and it is surprising therefore that the Survey had nothing to say about it in the Vizagapatam hills.[1] I have seen no specimens from this area and therefore follow Robinson and Kloss in their use of the above name.

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[1] I fear that many sportsmen in the Presidency will consider the account of the Game-birds inadequate, either because their own experience has told them a great deal about the distribution and numbers of the various species which has nowhere been recorded in print; or because increase of human population, opening up of the country by cultivation and the motor-car and the repeal of the Arms Act has materially altered the distribution and status of various species. I can only urge them to put their experience on record in the pages of the *Journal*.

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Gallus sonneratii Temminck.

Gallus sonneratii Temminck, Pig. et Gall., vol. ii (1813), p. 246—India, now restricted to the Eastern Ghats near Madras.

Specimens collected:—16 ♀ 10-4-29 Kurumbapatti; 477 ♂ 24-6-29 Tirthamalai 1,000 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
1 ♂ ad.	32	235	387	79 mm.
1 ♀	31	207	132	67 mm.

Spur of male measures from base to tip in direct line 36 mm.

Jerdon states that the Grey Jungle-Fowl is common in suitable localities on the Eastern Ghats from about the line of the lower Godavery and on the various isolated ranges of hills in the south of India. He adds that it is not rare in the Naggery hills near Madras and is constantly brought for sale to the Madras market. William Davison (*apud* Hume and Marshall, i, 234) also remarks that numbers are brought in to the Madras market from the Red Hills. LaPersonne reports it to be fairly common in all the Reserved Forests in the district of Salem, ascending the hills to about 3,000 ft. or higher where suitable jungle exists. Except for the above statements I can find no detailed information as to the exact range on the eastern side of the Presidency.

On the west the Grey Jungle-Fowl is more numerous, more widely distributed and better known. In Coorg and the Wynaad, in parts of Calicut district, throughout the Nilgiris, in the Walliar jungles, the Nelliampathies, Anamallais, Palnis and the whole of the Travancore Hills the bird is so generally distributed and so often recorded that there is no need to give the individual records. It occurs at all altitudes in the hills from their lowest slopes to their summits, but is scarce above 5,000 ft.

Opinions differ as to the breeding season from which the deduction may be fairly drawn that it is very irregular and extended unless Hume was right in his suggestion that it differs locally according to the parts of the hills subject to the influence of the north-east and south-west monsoons. Miss Cockburn at Kotagherry called it March to April. Waite at Coonoor said May and June. Davison at Neddivattum said October, November and December. Colonel H. R. Baker says February to the end of June, most nests being found in April and May. In the Nelliampathies Kinloch says it extends from February to October, while Stuart Baker, on the authority of Bourdillon and Stewart, says that in Travancore it is from March to July.

Excellent accounts of the habits of this Jungle-Fowl and of the sport that it affords in the Presidency are available; see for instance Davison, *Stray Feathers*, x, 409; Hume and Marshall, *Game Birds*, vol. i, pp. 231-239; Stuart Baker, *Game Birds*, pp. 156-162 and Colonel H. R. Baker, *Birds of S. India*, pp. 298-300.

Galloperdix spadicea spadicea (Gmelin).

Tetrao spadiceus Gmelin, Syst. Nat., vol. i, pt. ii (1789), p. 759—Madagascar *errore*—Nilgiris.[1]

Specimens collected:—44 ♀ 13-4-29, 81 ♂ 18-4-29 Kurumbapatti; 213 ♂ 12-5-29 Shevaroys 3,500 ft.; 704 [♀] 17-8-29 Palkonda Hills 1,000 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	21.5-23	153-161	130-133	43 mm.
2 ♀	21-21.5	140-147	105-123	40-42.5 mm.

No specimen has more than two spurs on one leg.

The Red Spur-Fowl is very widely distributed in the Presidency. It is found at Gumsoor and in the Northern Circars according to Jerdon and Hume though the former says that in the less wooded ranges of the Eastern Ghats

[1] Restricted to Nilgiris, Stuart Baker, *J.B.N.H.S.*, xxviii, 844.

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it is rare, being mostly replaced by the Painted Spur-Fowl. A specimen from Rajahmundri (♂ 4-4-1871, Blanford) is in the British Museum. Hume's statement (*Game Birds*, vol. i, 248) that it is found even in the low hills of Madras itself—no doubt the basis for Dewar's inclusion of the species in his list—is now amplified by the specimens collected by the Survey in the Palkondas and Shevaroys as well as at Kurumbapatti.

On the western side Betts says that the Red Spur-Fowl is common everywhere in Coorg, even in cultivated land where there is sufficient cover in the form of lantana scrub. It is also found throughout the Wynaad and the lower slopes of the Nilgiris up to about 5,000 ft., occurring also in smaller numbers to the summits where it has actually been shot at 7,500 ft. (Hume, *loc. cit.*). William Davison remarks (in 1883) on the improvement in their numbers since the introduction of a close season. In this area it presumably also occurs down to sea-level as there are a pair from Calicut in the Hume collection.

The breeding season in the Nilgiris is in February, March and April according to Miss Cockburn and in May and June according to William Davison.

Galloperdix spadicea stewarti Stuart Baker.

Galloperdix spadicea stewarti Stuart Baker, Bull. B.O.C., vol. xl (1919), p. 18—Travancore.

In Travancore this race of the Red Spur-Fowl is said by Ferguson to be common throughout the low country wherever there is forest. According to him it frequents the base of the hills and does not ascend them, but Elwes (*Ibis* 1870, p. 528) says that he occasionally saw the bird up in the Cardamom Hills and Stuart Baker (*Nidification*, iv, 228) says that it occurs in great numbers up to about 3,500 ft. The breeding season is said to be very regular extending from January to the end of March or early April and Bourdillon took c/2 fresh eggs on 6th September.

The Red Spur-Fowl is also found in the Palnis as recorded by Fairbank and Terry. The latter found it common at Pittur. It is also very common everywhere in the Nelliampathies, according to Kinloch, and Stuart Baker (*Nidification*, iv, 227) adds that Kinloch found them up to 4,000 ft. The latter took a clutch of eggs in July. No specimens are available for the racial identification of birds from the Palnis and Nelliampathies but from the analogy of other species I expect they will prove to belong to the Travancore race.

Galloperdix lunulata Valenciennes.

Perdix lunulata Valenciennes, Dict. Sci. Nat., vol. xxxviii (1825), p. 446—Bengal.

Specimens collected:—451 ♂ 20-6-29, 478 ♂ 24-6-29 Tirthamalai 1,000 ft.; 565 ♀ 20-7-29 Gingee; 824-5 ♀♂ 17-9-29, 829 ♂ 18-9-29, 831 ♀ 19-9-29 Kodur.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
4 ♂	22-23	148-154	111-122	40-45 mm.
3 ♀	21-21.5	132-142	99-106.5	35.5-43.5 mm.

No specimen has more than two spurs on one leg.

Although Jerdon tells us that the Painted Spur-Fowl is found all along the Eastern Ghats, and I have no doubt that it is common throughout their extent, we have no actual record in the Presidency from north of the Godavery Valley. Here Mr. R. Thompson found it in the hills north of Rajahmundry. From there southwards it is found, as Hume enumerates (*Game Birds*, i, 256) in the Nallamallai Hills, in Kurnool, in Bellary, Cuddapah, the Eastern Ghats inland of Nellore, about Tutapur and southwards to near Pondicherry. The gap in this enumeration is filled by the Survey specimens and LaPersonne also reported that it was very common in the Palkonda Hills at varying altitudes where suitable jungle occurs, and also common in the forest reserves of Salem district, chiefly found at low elevations but occurring as high as 4,000 ft. in the Shevaroys.

It also occurs at Pondicherry which is the type locality for the synonym *Francolinus nivosus* of Delessert, Mag. de Zoöl., 1840, Ois., p. 18, and two

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male cotypes are in the Museum of Comparative Zoology at Harvard College, vide *Bulletin* lxx, No. 4 (1930), p. 157, of that Museum.

In the western side of the Presidency the Painted Spur-Fowl is only recorded from the circumference of the Nilgiris and in the Palghat district. Hume says it has been found between Metapolliam and Burliar, between Burliar and Coonoor, near Kullar, in the orange valley below Kotagiri. On this side it appears to be very scarce. Two males, marked 17-9-1876 Metapolliam (Wardlaw-Ramsay) and 11-11-1883 Coonoor (Davison) are in the British Museum. On the northern circumference Morgan (*S.F.*, ii, 532) says that he had seen and shot it at various times on the Seegore (Sigur) Ghat and Major Phythian Adams informs me that it is not uncommon at Anaikatti.

It also occurs south of the Nilgiris in the Palghat district and Hume (*loc. cit.* and *N. & E.*, iii, 425) received several specimens thence, apparently from the Walliar jungles.

Nothing very definite seems to be known about the breeding season in the Presidency but Col. H. R. Baker took eggs in the Eastern Ghats on 18th June (*Nidification*, iv, 230).

Excalfactoria chinensis chinensis (Linnaeus).

Tetrao chinensis Linn., Syst. Nat., ed. xii, vol. i (1766), p. 27—Nankin, China.

Not procured by the Survey. The Blue-breasted Quail does not appear to have been recorded from the Presidency further north than 'the Carnatic' where Jerdon says he once procured it. Dewar includes it without remark in his Madras list but these two vague records are substantiated by Mr. F. Bidie (*S.F.*, ix, 208) who, whilst snipe-shooting near Goodavancherrie in Chingleput, killed a pair in December.

On the west William Davison tells us that he met with it sparingly through the grassy portions of the Wynaad. Ferguson says also that it occurs in the grass lands of Pirmeed in Travancore.

This quail is to some extent migratory and its status in the Presidency is not yet known. I can find no difference between Indian and Chinese birds.

Coturnix coturnix (Linnaeus).

Tetrao coturnix Linnaeus, Syst. Nat., ed. x, vol. i (1758), p. 161—Sweden.

The Common or Grey Quail was not procured by the Survey, and the Presidency appears to be beyond the reach of its ordinary migrations. On the eastern side it is only recorded by Dewar who includes it in his list without comment.

On the west William Davison says that he shot a female within 3 miles of Ootacamund on 14 January 1881, and that in former years he had met with them in the Nilgiris on a few occasions.

The footnote in Hume and Marshall (vol. ii, p. 133) regarding the occurrence of Quail in Travancore, which is apparently the basis for Ferguson's suggestion that the Grey Quail may occur on the grass lands of Pirmeed, is only doubtfully referable to this species.

No specimens are available for racial identification.

Coturnix coromandelicus (Gmelin).

Tetrao coromandelicus Gmelin, Syst. Nat., vol. i, pt. ii (1789), p. 764—Coromandel coast.

Not procured by the Survey. There is very little on record about the status and distribution of the Black-breasted Quail in the Presidency. On the eastern side it is only recorded from Madras, where Dewar includes it in his list without comment. There are in the British Museum several Madras specimens collected by Wardlaw-Ramsay, and the only dated skins were obtained in June. A partial albino in the Madras Museum is described by W. F. Dique in *Stray Feathers*, ix, 508.

On the western side William Davison says it occurs in the Wynaad and mentions that he once shot one out of a small covey on the edge of the Government Cinchona plantations at Neddivattum and another bird in Ootacamund.

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This quail does not figure in Ferguson's Travancore list but there are two males in the British Museum, collected in Travancore, apparently near Trivandrum by Fry.

Perdicula asiatica asiatica (Latham).

Perdix asiatica Latham, Index Orn., vol. ii (1790), p. 649—Mahratta region, now restricted to Poona.

Specimens collected:—463-4 [♂]♂ 23-6-29 Tirthamalai 1,000 ft.; 663 ♀ 7-8-29, 749 [♀] 25-8-29 Palkonda Hills 1,000 ft.; 902 ♂ 11-10-29 Seschachalam Hills 2,000 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
3 ♂	13-14	82-85	39-41	23.5-26 mm.
2 ♀	13-14	83.5-86.5	40-41	23-24 mm.

There is still a good deal to learn of the distribution of the Jungle Bush-quail in the Presidency and I have so far found no definite record of its occurrence north of the Palkonda and Seschachalam Hills, in the former of which LaPersonne remarks that it was in small coveys on bare hillsides. LaPersonne did however come across coveys of some species of quail—which may well have been this though no specimens were obtained—both in open scrub jungle and in thick forest in the Vizagapatam area at Sankrametta.

Jerdon considered this quail rare in the low Carnatic but in addition to the two Survey specimens from Tirthamalai there is another Salem district specimen in the British Museum, a male collected at Pothanore on 18 October 1868 by Carter. It evidently occurs commonly in the Tinnevelly district as Ferguson states that numbers were caught there and brought alive for sale in Trivandrum. He was doubtful whether this species occurred at all in Travancore, except possibly in the dry area round Cape Comorin but according to Stuart Baker (*Nidification*, iv, 240) Stewart found them breeding from January to March, most eggs being laid in February. The area is not specified.

The only other information about the Jungle Bush-quail I find on the west is a female in the Sparrow collection obtained at Malappuram on 16 July 1912 (of which more anon), a male and two females in the British Museum collected by William Davison near Seegore on 22 February 1881 and Hume's statement (*Game Birds*, ii, 111) that he had seen a specimen from the Wynaad.

In his review of this genus (*J.B.N.H.S.*, xxix, p. 310) Mr. Stuart Baker first introduced the theory that the Rock Bush-quail and the Jungle Bush-quail are merely two races of one species, a theory which is somewhat surprising in view of the fact that both forms are found to coincide in their distribution over a considerable part of India. He accounts for this theory by stating that the two birds normally occupy a different type of terrain, that the two forms grade into each other and that intermediates are not uncommon. The last are said to occur in intermediate country and form the link between two sub-species which are probably of very recent origin. *P. asiatica* he says breeds in places fairly well covered with jungle of some kind whereas *argoondah* breeds in rocky open upland or bare plains. The intermediate country here apparently means the country intermediate in character between the two distinctive terrains described, which are both found here and there over most of India. This conception is an intelligible if unlikely one. In the *New Fauna* (v, 376) however the conception changes. 'The distribution of the two, he says, is most puzzling, as they constantly overlap, but many individuals are exactly half way between the two and it would seem that, whilst the extremes are very distinct, there is an immense intervening area where there is no really constant form.' This, if it means anything, can only mean that on one edge of the range *asiatica* is found, on the other edge *argoondah* and that the intermediates are found (not on the intermediate country between two types of country, both found all over the range as in the earlier conception but) over an immense area at their point of junction.

The difficulties obviously inherent in these mutually destructive theories have made me examine the case of these two forms with particular care and I have been able to supplement the British Museum series with nearly 50 extra

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specimens from my own collection or through the kindness of Mr. H. W. Waite, Mr. E. A. D'Abreu, Mr. Salim A. Ali, Colonel R. Sparrow and the Society. As a result I find myself in complete disagreement with Mr. Stuart Baker. In the first place the intermediate specimens which apparently gave rise to his theory and which are necessitated by it do not exist in fact. There is no intergrading between adults of *asiatica* and *argoondah*. Both remain true to type and are easily separable. What Mr. Stuart Baker has mistaken for intermediates are immature birds of both forms. Their plumage stages are not at present easily worked out, chiefly because of the unreliable sexing of many specimens, and without previous experience the identification of these young birds is not altogether easy. Adults are easily identified throughout the whole range and there is no ground at all for suggesting that an area of true *asiatica* is separated from an area of true *argoondah* by an immense intermediate area in which variable birds, inclining some to one form some to the other, are found.

In the *Old Fauna*, *asiatica* and *argoondah* were treated as two straightforward species which could be easily separated and identified. This conception seems to me entirely correct. The males have certainly a general resemblance but no one with any experience of the genus could fail to identify every specimen on the characters given. The females on the other hand differ very widely in plumage pattern and the differences are of kind rather than degree, i.e. specific rather than subspecific. The decisive factor, however, is even stronger than this. *P. argoondah* is the form with the more restricted distribution. This distribution is such that one would not expect it to lead to the development of races and it has not in fact done so. In all parts of its range *argoondah* is invariable in size and colour. *P. asiatica*, on the other hand, has a much wider distribution, a distribution that has rendered it liable to the formation of races of its own, though these have hitherto not been named. These follow the ordinary lines of racial development in widely distributed Indian birds. There is an island race in Ceylon, a richly-coloured race on the western coast, whilst in the Peninsula proper there is a definite grading in colour and size from north to south. If *asiatica* has its own races, and *argoondah* occupies a portion of the range of *asiatica* alongside it, the obvious deduction is that the two forms are separate species, and not races of each other. As such I shall treat them.

The differences in the two races which I am about to name were noticed long ago by Legge (*Birds of Ceylon*, p. 753) and Hume (*S.F.*, ix, 77) respectively. In Ceylon the upper plumage of both sexes is much darker throughout, with the black blotching and the pale shaft-streaks of the scapulars reduced in extent so that these parts do not contrast so strongly with the rest of the plumage as in the typical race. The chestnut throat-patch is also far darker than in the typical race. For this race I propose the name

PERDICULA ASIATICA CEYLONENSIS subsp. nov.

Type:—♂ adult 1894 Cocoawattee, Ceylon (Butler), British Museum register No. 1916.9.20.503.

The second race is based on the fine series collected by Vidal in the South Konkan. These birds, both adult and immature, differ from the typical race in the deep reddish tint of the whole upper plumage, which is even more particularly marked on the crown. In the adult males the black barring of the lower plumage is broader than in the typical form. This race may be known as

PERDICULA ASIATICA VIDALI subsp. nov.

Type:—♂ adult 22 February 1879, Kelsi, S. Konkan (Vidal), British Museum register No. 1889.5.10.658.

This race probably extends down the Malabar coast to Travancore as the only specimen I have seen from this area, the bird in Colonel Sparrow's collection from Malappuram, is of the same red colour. The three Nilgiri specimens examined, being from the northern face of Seegore, do not of course belong to it.

As regards the grading in size and colour from north to south in the rest of the Peninsula, I am at present content to point it out. More specimens from Southern India may show that a horizontal division into races is desirable.

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Perdicula argoondah (Sykes).

Coturnix argoondah Sykes, P.Z.S. 1832 (November 22), p. 153—Dukhan.

The *New Fauna* states that the Rock Bush-quail is found in the south-east of India from Madras to the extreme south. This statement is no doubt based on Hume and Marshall (*Game Birds*, ii, p. 117) who say 'it occurs in the Peninsula on the eastern side down to the extreme south and in all the drier eastern Madras districts and even near Coimbatore.' There is a female from Coimbatore dated 3 October 1868 (Theobald) in the Hume collection but I have seen no other direct evidence of the occurrence of this species in the Presidency and it is possible that there is some mistake. It will be remembered that Jerdon transposes the names of these two quails and some confusion has in consequence probably crept into the records. It is to be hoped that local observers will clear up the point.

Cryptoplectron erythrorhynchum erythrorhynchum (Sykes).

Coturnix erythrorhynchum Sykes, P.Z.S. 1832 (November 22), p. 153—Valley of Karley, Dukhan.

Not met by the Survey. The Painted Bush-quail is a very characteristic species on the hills of the western side of the Presidency. In Coorg it is somewhat scarce, according to Betts, though occasional coveys may be met with dusting on the roads. In the Wynaad William Davison calls it not uncommon and in the Nilgiris it is—or was for it is now scarce near Ootacamund—abundant everywhere, apparently at all elevations. An exhaustive account of the habits in this area by Davison and Miss Cockburn will be found in Hume and Marshall (ii, p. 123) and it may be supplemented by a note from Primrose (*J.B.N.H.S.*, xxiv, p. 596). Kinloch found it in large numbers on the Lily Downs 4,000 ft. in the Nelliampathies.

In the Palnis Fairbank met it in Kodaikanal and Terry called it fairly common in places though never numerous enough to allow of a decent bag being made.

In Travancore Ferguson says he only met with it on the Cardamom Hills and the High Range.

The only record of the Painted Bush-quail on the eastern side of the Presidency comes from Yercaud where W. Mahon Daly (*J.B.N.H.S.*, ii, 149) describes an instance of its bravery in defence of its young.

The breeding season seems to be very extended. Miss Cockburn gives January, February, March and September-October as the months for eggs in the Nilgiris. Darling says August to November for the Wynaad and Nilgiris. In Travancore Bourdillon is said to have obtained eggs in January and February, July to September and in December.

Francolinus pictus pictus (Jardine and Selby).

Perdix picta Jardine & Selby, Illustr. Orn. (April 1828), pl. 50—Bangalore.

It is curious that the Painted Partridge was not procured by the Survey as the evidence goes to suggest that it is, or was, generally distributed through much of the eastern side of the Presidency. Jerdon says that the Painted Partridge occurs throughout Chota Nagpur to the more open parts of the Northern Circars, as far as Cuttuck. I am not clear how much of the Presidency this is meant to include but according to Hume (*Game Birds*, ii, 20) it occurs in hilly semi-jungle country and where there is much grass in the Kistna and other more northern districts right up to the Goomsur taluka of the Ganjam district. He also states that it occurs in the Godavari district and it certainly occurs in parts of the upland talukas of the Masulipatam district (Horsfall, *S.F.*, ix, 208), a statement which is corroborated by a skin in the British Museum collected on 20 April 1880.

South of this again, we learn from Hume, the Painted Partridge was shot in the Anamalai Hills of the Kurnool district (Mr. Cardozo), about the Ramandroog and Sandur jungles of the Bellary district (Mr. Gordon, Mr. Cardozo and Captain Bellis) and on both sides of the Eastern Ghats in the Cuddapah and Nellore districts. There then appears to be a break in its distribution and Hume quotes Theobald as authority for its occurrence in the Coimbatore

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district where it is found about the jungles called Nuddacovil between Kollegal and Bhavani in Northern Coimbatore. It can be heard in several parts of the jungle of the Kollegal taluka.

I am quite unable to understand the distribution of the two races of the Painted Partridge as defined in the *New Fauna*. There must have been some muddle in the type setting. I do not feel quite certain that *Francolinus pictus pallidus* is a sufficiently good race to be worth maintaining. Specimens from Deesa, Anandra, Jhansi, Bundelkund, Ahmedabad and Neemuch in the British Museum do, perhaps, appear a little paler than those from further south and as a series perhaps justify the keeping up over the name *pallidus*. Mr. Stuart Baker has, however, overlooked a far better race in Ceylon. The three specimens from Ceylon in the British Museum differ from the typical race in the much darker brown tint of the upper plumage with the spotting on the back of the neck and the white edging of the mantle and scapulars much reduced. The lower plumage is also much more heavily marked with black, that of the female being much more definitely barred than in the typical race. If these specimens are representative the sexes differ more than in the continental race. Legge (p. 745) had already suggested that the Cinghalese bird might prove separable. So I now carry out his expressed desire that the race if separated should be called after Colonel Watson, one of the noted old shikaris in Ceylon. It will stand as *Francolinus pictus watsoni* Legge, Birds of Ceylon, vol. iii (1880), p. 745—Wellemade, Ceylon.

Attention may be drawn to the two specimens labelled 'Bihar' (Hodgson) in the British Museum. They are said to be hybrids with *Francolinus vulgaris* but this appears to me unlikely and the birds may represent an unnamed race from the north-eastern area. Further specimens of this partridge from different parts of its range are clearly needed for examination, both for the accurate study of its races and for a complete understanding of its plumages.

Francolinus pondicerianus pondicerianus (Gmelin).

Tetrao pondicerianus Gmelin, Syst. Nat., vol. i, pt. ii (1789), p. 760—Pondicherry.

Specimens collected:—469 ♂ 11-6-29 Chitteri range 3,000 ft.; 472-474 ♂♂♂ imm. 23-6-29, 479 ♂ imm. 24-6-29 Tirthamalai 1,000 ft.; 596 ♀ 24-7-29 Tindivanum.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
1 ♂ ad.	25	153	83	46.5 mm.
4 ♂ imm.	24.5-25	moult	66-74	40-42 mm.
1 ♀	25.5	moult	72	39 mm.

I can find no information at all as to whether the Grey Partridge occurs in the north-east side of the Presidency anywhere further north of Madras where Dewar includes the name without comment in his list. From there southwards it appears to be common—occurring certainly up to 3,000 ft.—as La Personne reports that it is netted on a fairly large scale in the zamindari forests. The professional netters, he says, wander from district to district like the Persian gypsies. Their outfit consists of a cow and a single long net some 10 to 15 ft. in width. The method adopted is simplicity itself. The cow is let loose in a field frequented by partridges and one man covered with an old cow-hide walks alongside her. The cow is trained to turn to right or left as she is nudged and by this means she is used to drive the partridges gradually towards an opening where the net has been placed.

The Grey Partridge is also doubtless common in the area south of that worked by the Survey as Hume records it from Rameswaram Island (*S.F.*, iv, 459), shot it at Tuticorin (♂ 11-3-75 in the British Museum) and saw it within a stone's throw of the square beacon that marks the southernmost extremity of the Peninsula (*Game Birds*, ii, 51). It is in fact fairly common in the neighbourhood of Cape Comorin (Ferguson), the only part of Travancore suited to it.

The only other part of the western side of the Presidency where I know of its occurrence is on the slopes of the Nilgiris where William Davison says it occurs sparingly on the Sigur side. He says up to 5,000 ft., evidently

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referring to the straggler killed at Kalhatty (Hume and Marshall, ii. 51) but Hume gives a more conservative estimate of 1,500 ft. as the normal upper limit on this side. Colonel H. R. Baker considers it common round Musnigudi.

Nothing has been recorded as to the breeding season in the Presidency but LaPersonne saw a young brood with the parents in the Chitteri range at 3,000 ft. in June.

Turnix suscitator taigoor (Sykes).

Hemipodius taigoor Sykes, P.Z.S. 1832 (November), p. 155—Dukhan.
Specimen collected:—80 ♀ 18-4-29 Kurumbapatti.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
1 ♀	14	86.5	36	22 mm.

The Common Bustard-quail is found, according to Hume (*Game Birds*, ii, 170), throughout the Madras Presidency and in Travancore, but there is not much evidence in support of this somewhat sweeping assertion. On the eastern side I can find no record of its occurrence north of that very vague locality the Carnatic. Here according to Jerdon there was a practice of snaring females with a decoy and in this way he had known 12 to 20 birds occasionally captured in a day, which suggests that the species was fairly common. A specimen from Chingleput in the Madras Museum and the statement by Theobald (*N. & E.*, iii, p. 367) that he had taken the nest at Ahtoor in the Shevaroys completes the evidence from this side.

On the west Major Phythian Adams shot one from a couple on partly flooded paddy stubble near Cannanore in September 1927 (*Birds of S. India*, p. 321). A specimen collected by Theobald on 26 October 1868 at Coimbatore is in the Hume collection. Fairbank says that he observed the species in gram fields near the base of the Palnis and Ferguson says that it is not uncommon in scrub jungle in the low country of Travancore.

Five specimens from 'Madras' in the British Museum (Jerdon, Gould, Hume collection) and a female collected by Nair on 15 February 1899 at Pudmanabhapuram (a locality which I cannot find but presume to be in Travancore) complete the evidence for the Presidency.

The breeding season in the Carnatic is said by Jerdon to be from July to September and Theobald's eggs were taken at Ahtoor on 20 August. The Survey specimen collected at Kurumbapatti on 18 April, however, contained an egg ready for expulsion.

As regards the race or races of this Bustard-quail which occur in the Presidency I suffer from the difficulty of lack of proper material. The only two specimens with proper data (Coimbatore, Kurumbapatti) are clearly referable to the race *taigoor*. The five 'Madras' birds on the other hand agree with specimens from Belgaum and Dapuli, S. Konkan in the British Museum which seem to me very red and suggest the possibility of an erythristic race on the West coast, as in the case of *Perdicula asiatica*.

The Pudmanabhapuram bird, on the other hand, cannot be distinguished from the Cinghalese race *Turnix suscitator leggei*, but perhaps this unidentified locality is really in Ceylon. There is also much individual variation in these Bustard-quails and it is to be hoped that observers in the Presidency will make a point of collecting some fresh material to settle these difficulties.

I should like also to direct the attention of observers to the breeding habits of this genus. So far as Indian literature is concerned there is not much exact evidence to support the full accounts given of their polyandrous habits. The proved pugnacity of the females is after all not necessarily inconsistent with monogamy and both sexes have certainly been found brooding eggs, a practice denied to the female in the current accounts.

[**Turnix sylvatica dussumier** (Temm. and Lang.).

Hemipodius dussumier Temminck and Lang., Planch. Color. d'Ois., livr. 76 (1828), pl. 454, fig. 2—Bengal.

According to the *New Fauna* (vol. v, p. 452) the Little Button-quail occurs on the Nilgiris and hills of Southern India everywhere up to the peaks,

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though this statement is modified by the author in *Game Birds* (vol. iii, p. 32) to the effect that it is extremely rare on the highest parts of the Nilgiris. Mr. Stuart Baker also states (*Nidification*, iv, 286) that Stewart twice found it breeding in Travancore. As these statements conflict with the experience of Davison, Bourdillon, Ferguson and others who worked these areas carefully for years and as the identification of Button-quail is a notoriously difficult matter, I am not yet inclined to admit this species to the Presidency list.]

Turnix tanki tanki Blyth.

Turnix tanki Blyth, J.A.S.B., xii (1843), p. 180—no locality = Bengal.

Specimens collected:—45 ♂ 13-4-29 Kurumbapatti; 1588-9 ♀♂ 24-3-30 Sankrametta 3,000 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	13.5-14	82-84	27.5-30	23 mm.
1 ♀	14	93.5	31.5	24 mm.

Jerdon says that the Indian Button-quail is not uncommon in the upland districts of Malabar and in the Eastern Ghats and this statement is apparently roughly correct. On the eastern side the Survey obtained the above specimens at Sankrametta and Kurumbapatti and Stuart Baker states (*Nidification*, iv, 287) that he had received birds and eggs from Tinnevelly. Hume received a skin from Bourdillon from S. Travancore (Hume and Marshall, ii, 187) and Terry states that he shot one at Pulungi in the Palnis. Stuart Baker states (*New Fauna*, v, 456) that in this area it occurs up to 4,000 ft. but I know not on what authority. William Davison collected a male on 13 May 1881 at Karote at the foot of the Banasore Peak in the Wynaad and this specimen is still in the British Museum.

This completes our knowledge of the Button-quail in the Presidency and nothing definite seems to be on record as regards the breeding season or the status of the species.

Hypotaenidia striata gularis (Horsfield).

Rallus gularis Horsfield, Trans. Linn. Soc., xiii (1821), p. 196—Java.

Not obtained by the Survey. The Blue-breasted Banded Rail is probably a resident species in the Presidency though very little is really known about it.

The late Mr. J. Darling found a nest with 5 eggs in a small swamp at Sultan's Battery, Wynaad, 2,000 ft., on 26 August and in addition found the hatched shells of three other nests. William Davison mentions examining fragments of a skin obtained by Darling in the Wynaad, and it was either these fragments or a female in the British Museum obtained by Darling at Vythery, Wynaad, on 26 August 1874 that was doubtless connected with the identification of the above nest (Hume and Marshall, ii, 249; *S.F.*, x, 415). A female from Kotagherry (15 March 1875 Miss Cockburn) is also in the British Museum.

Cardew records it from Cannanore (*Birds of S. India*, p. 325) and Terry obtained a female (now in Dr. C. B. Ticehurst's collection) on 4 April at Pulungi in the Palnis. A banded rail observed by Captain Bates on April 29 on the downs outside Kodaikanal at 6,500 ft. may have been of this species.

In Travancore, according to Ferguson, this rail may be found scattered about in marshy thickets near the coast. A pair in the Hume collection from the 'west coast of Madras' may perhaps be Travancore birds.

There is no very definite evidence as to the occurrence of this rail on the eastern side of the Presidency. Hume received two specimens from Captain Mitchell *said* to have been procured in the Madras market but the italics suggest that Hume suspected some mistake in the matter.

Specimens of this rail from N.-E. and S.-W. India appear to me to belong to the same form and to be larger and with less black on the upper parts than specimens of the typical race from the Philippines. These Indian birds are attributed by Stuart Baker to *gularis* (Java) but by Chasen (*Handlist of Malaysian Birds*, p. 24) to a separable larger race *Rallus albiventris* Swainson Animals and Menag. (December 1837), p. 337—India. The difficulty is that

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there is no proper series available to furnish the measurements of Javan topotypes, which agree with Indian birds in colour. As the type of *gularis* in the British Museum has a wing of 117 mm. and two birds (♂♂) from Ceylon have wings (118, 120.5 mm.) I propose to follow Stuart Baker in uniting Indian birds with the Javan form, until such time as a Javan series is available to establish otherwise.

[**Porzana porzana** (Linnaeus).

Rallus porzana Linnaeus, Syst. Nat., ed. xii (1766), vol. i, p. 262—France.

Jerdon states that the Spotted Crake is found over all India and in particular reference to a Rail obtained in a swamp in the Nilgiris which he believed to belong to this form (*Madras Journ. Lit. Sci.*, 1844, p. 174). There is a specimen labelled Madras in the Madras Museum. As however there does not appear to be any particular history to this specimen and as the species is not otherwise recorded from nearer than Belgaum, I think it better not to admit this species to a full place on the Presidency list.]

Porzana pusilla pusilla (Pallas).

Rallus pusillus Pallas, Reise Russ. Reichs., vol. iii (1776), p. 700—Dauria.

Baillon's Crake has only been recorded from the western side of the Presidency, and there apparently only on three occasions. Hume says (*S.F.*, x, 415) that he had received one from the Wynaad though the specimen is no longer in the Hume collection.

Ferguson states that he received a single specimen in Travancore, brought to him alive in December. He adds that it had evidently bred there as there was a young one with it, but this was I presume only hearsay and is hardly likely to have been correct. A female collected at Charki, Trivandrum (Bourdillon) on 18-11-1878 is in the British Museum.

In the *New Fauna* (vi, p. 15) the nest is said to be very hard to find as the bird always creeps quietly away from it. In *Nidification* (iv, 295) it is stated that the nest is not hard to find as the bird generally flies direct from it.

Rallus eurizonoides amuroptera (Jerdon).

Porzana amuroptera Jerdon ex Blyth, MSS. Birds of India, vol. iii (1864), p. 725—Orissa.

Very little is known about the Banded Crake in the Presidency and it was not procured by the Survey. On the eastern side it is only recorded from Gumsur in Ganjam, whence Blyth obtained it (*Catalogue Birds. Mus. As. Society*, p. 285), and Madras from which neighbourhood the Madras Museum obtained a single specimen (Hume and Marshall, ii, 238).

On the west a male was collected by Captain Gosse on 28 June 1918 on the Rookey Estate, Kil Kotakiri 4,300 ft. This bird was shot in a swamp in the bottom of a deep valley near the factory and is now in the British Museum.

It occurs in Travancore. Hume obtained a specimen from the Assambo Hills (*loc. cit*). A specimen marked 'Mynall' with no other data is in the Hume collection, and Ferguson states that he procured one in 1875 in some paddy fields near the foot of the hills in S. Travancore at about 400 ft. I am not quite clear how many different specimens these three records refer to or whether they all actually refer to the same bird. There is however another Travancore specimen in the British Museum, without proper data, collected by Fry.

Finally in the *Journal* (xii, 216) Mr. W. N. Fleming records a specimen caught at Tuticorin on 14 November 1896, exhausted after a cyclone from the N.-E., a record which recalls Hume's account of the arrival of this species on the coast of Ceylon.

The name *nigrolineatus* Hodgson in Gray's Misc. 1844, p. 86, finally adopted for the Indian bird by Mr. Stuart Baker, *Nidification*, iv, 295, cannot be used as it is a *nomen nudum* and quoted as a synonym of *Rallus superciliaris* Eyton (vide Peters, 1934, p. 172). The next name available is *Porzana amuroptera* Jerdon ex Blyth, MSS. *Birds of India*, vol. iii, 1864, p. 725. The type locality is Orissa, vide *Ibis* 1867, p. 310.

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I have provisionally accepted Mr. Stuart Baker's identification of South Indian birds with those found in Northern India, though the birds that I have measured from Ceyon and S. India appear to be somewhat smaller. So few of the specimens available are, however, reliably sexed that, in view of the difference in size of the sexes in rails, I have hesitated to accept a southern race until better material is available.

Amaurornis fuscus fuscus (Linnaeus).

Rallus fuscus Linnaeus, Syst. Nat., ed. xii, vol. i (1766), p. 262—Philippine Islands.

Not procured by the Survey. The Ruddy Crake has hitherto only been recorded from the western side in the Presidency, from the Wynaad and Travancore. Of the former William Davison remarks that he only saw and obtained two males on 2 May at Karote in some rice fields. There are however three specimens in the British Museum collected by him at Karote, namely two males shot on 12 May 1881 (so 2 May is doubtless a misprint) and a female shot on 16 May 1881.

As regards Travancore Ferguson considered the Ruddy Crake fairly common. In his time the Trivandrum Museum contained 6 specimens namely an Anjango skin, two from an old collection labelled Travancore and three taken at Kuttyani near Trivandrum in April. A Bourdillon specimen with no precise data is in the British Museum. In *Nidification* (iv, 300) Stewart is said to have once taken the nest in Travancore but no details are given.

Mr. Stuart Baker [*Bull. B.O.C.*, vol. xlvii (1927), p. 73] has separated Cinghalese and S. Indian birds from the typical race (Philippines) as *Amaurornis fuscus zeylonicus*, as being much paler and faintly tinged with yellowish olive above. There appears to be no real difference in size and the supposed colour difference I have failed to recognise. Under the circumstances therefore I keep these southern birds with the typical race. They are of course smaller (wing 90.5-98.5 mm.) than N. Indian birds *A. f. bakeri* (wing 100.5-109.1 mm.) which are again slightly smaller than *A. f. erythrothorax* of Japan (wing 111.5-118 mm.).

Amaurornis phoenicurus phoenicurus (Pennant).

Gallinula phoenicurus Pennant, Ind. Zool. 1769, p. 10, pl. ix—Ceylon.

Not procured by the Survey. In the Presidency the White-breasted Waterhen is best known on the western side. It is presumably a resident species.

In Coorg it is evidently not common for Betts calls it a shy and solitary bird which may occasionally be flushed. William Davison says that it is rare on the Nilgiris and their slopes but not uncommon at the base of the hills through the Wynaad. He did however procure it in the Botanical Gardens at Ootacamund. Colonel Sparrow's collection contains a specimen killed at Kolletur, Malappuram, on 13 December 1912.

In Travancore, according to Ferguson, it is found throughout the low country round the edges of paddy fields.

On the eastern side the sole authority for its occurrence is Dewar's remark that it is rare at Madras.

Ferguson gives the breeding season in Travancore as April.

In the *Ibis* 1924, pp. 509-10, Ticehurst gives his considered opinion that birds from India and Ceylon are inseparable, the variation in size and the colour of the under tail-coverts being individual. With this opinion, I agree, having arrived at it independently on the examination of fresh material not seen by Ticehurst.

Gallinula chloropus indicus Blyth.

Gallinula chloropus ? var. *indicus* Blyth, J.A.S.B., vol. xi (1842), p. 887—India, Nellore.

Not procured by the Survey. The Waterhen is far rarer in Southern India than in the north and there are practically no records for the Presidency. I have examined no local specimens but assume that they are not likely to be different to those of India generally. Status unknown.

William Davison says that he has often seen the Waterhen in the Wynaad and that it is common on the lake at Ootacamund, breeding in the sedges of the margin. This latter statement was doubtless correct at the time but as

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Col. H. R. Baker points out (*Birds of S. India*, p. 332) the lower portion of the lake was reclaimed many years ago and the Waterhen has disappeared in consequence.

Ferguson states that it is by no means common in Travancore, there being only one specimen in the local museum.

On the eastern side this species is only recorded from Madras where Dewar calls it rare, his record being probably based on the local specimen in the Madras Museum.

Jerdon was at Nellore when he sent the type specimen to Blyth.

Gallicrex cinerea (Gmelin).

Fulica cinerea Gmelin, Syst. Nat., vol. i, pt. ii (1789), p. 702—China.

Not procured by the Survey. There is as yet very little information about the distribution of the water-cock in the Presidency and it is probably more common than is at present realised.

Dewar calls it rare at Madras but its occurrence is substantiated by a local specimen in the Museum. On the west Major Phythian Adams informs me that it is common about Cannanore. In Travancore, according to Ferguson, it is not uncommon in and about the rice cultivation of the low country. Two 'Anjango' females are in the British Museum.

Nothing is known about the breeding season in the Presidency though the bird is presumably a resident.

When a proper series is available the racial identity of South Indian and Chinese birds will require checking.

Porphyrio poliocephalus poliocephalus (Latham).

Gallinula poliocephala Latham, Suppl. Index. Orn. (1801), p. 68—India.

So far the Purple Coot has only been recorded from two areas in the Presidency, the neighbourhood of Madras and in Travancore. At Madras according to Dewar the Purple Coot is fairly common.

In Travancore Ferguson states that it is common in all the larger lakes wherever there are reeds and rushes, and this information is amplified by Bourdillon's statement (*S.F.*, vii, 39) that the bird is found in great numbers in the reed-beds of the Vellarney Lake, though for some reason (possibly the increase of vegetation) it appeared scarcer in June than in March.

Ferguson gives the local breeding season as July and August.

No specimens were procured by the Survey and I have seen none from anywhere in the Presidency. As however Ceylon birds appear to me to be identical with those from North-West India there can be little doubt that Presidency birds belong to the typical race.

Latham's name was based on a drawing by General Davies of a bird in the Exeter Exchange.

Fulica atra atra Linnaeus.

Fulica atra Linnaeus, Syst. Nat., ed. x, vol. i (1758), p. 152—Sweden.

The coot was not reported by the Survey and it appears to be scarce in the Presidency, though Howard Campbell found it breeding in the Cuddapah district (*J.B.N.H.S.*, xiv, 392). In 1892 he found a nest with 3 hard-set eggs on 30th September in a small tank near the town of Cuddapah. On 30 October of the same year he found several nests with fresh eggs in a small reedy tank at Occhaveli. He considered that the coot was probably double-brooded as a brood of young were seen following their parents on a tank early in April.

Finn includes the species in his Madras list, probably on the strength of a local bird which is in the Museum.

I have examined no specimen killed in the Presidency but have no reason to think that Presidency birds do not belong to the typical race, like all other Indian specimens.

Metopidius indicus (Latham).

Parra indica Latham, Index. Orn., vol. ii (1790), p. 765—India, Bengal.

Not procured by the Survey. Very little has been recorded about the Bronze-winged Jacana in the Presidency. As regards the west a specimen

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from Coorg is in the Tweedale collection in the British Museum. William Davison states (*S.F.*, x, 415) that Mr. T. Darling of the Rasselas estate near Manantoddy, Wynaad, procured a specimen. In Travancore, according to Ferguson, this Jacana is to be met with in suitable localities throughout the country. A male from the Vellarney Lake (5-2-1879 Bourdillon) is in the British Museum as well as a Fry specimen, and four 'Madras' specimens from Rev. H. H. Baker.

Dr. Gravely informs me that a local specimen is in the Madras Museum.

Bourdillon obtained eggs in Travancore in August, vide Stuart Baker, *Nidification*, iv, 321.

This species apparently has no races.

Hydrophasianus chirurgus (Scopoli).

Tringa chirurgus Scopoli, Del. Flor. et Faun. Insubr., vol. ii (1786), p. 92—[New Guinea] Luzon, Philippines.

The Pheasant-tailed Jacana was not procured by the Survey and we have even less information about its status in the Presidency. It evidently occurs at Madras for there is a local specimen in the Madras Museum and there are two Madras skins (one undated; one 1876, both Wardlaw-Ramsay) in the British Museum.

Ferguson says that flocks are common in the tanks of South Travancore, especially about Nagercoil.

This species apparently has no races.

Rostratula benghalensis benghalensis (Linnaeus).

Rallus benghalensis Linnaeus, Syst. Nat., ed. x (1758), vol. i, p. 153—Asia, Bengal.

Not procured by the Survey. The Painted Snipe is, I presume, very generally distributed in suitable places throughout the Presidency and no doubt many sportsmen can supplement the following details which I am about to enumerate. On the eastern side it is recorded from Jeypore (Ball). Mr. R. F. Stoney kindly informs me that they are fairly common both at Nellore and in Chingleput district and Dewar includes it in his Madras list. A local specimen is in the Madras Museum.

An interesting note by A. Theobald will be found in Hume and Marshall (vol. ii, p. 383). He says 'I have seen and shot this bird almost all over Southern India south of the 12° North Latitude. In the dry districts it comes in during the cold weather and remains till all the swamps and fields are dry but in well watered portions, like Tinnevelly, Tanjore, Malabar and parts of Coimbatore I have shot them throughout the year. I have never found the nest, but heard of one being taken near Erode. They are common in the inland districts but rare towards Madras, where they are caught in large numbers [sic] for the sake of their skins which are imported to China. [This trade we may now hope has been put an end to.] The bird fetches from two to four annas each in the Madras market, while the preserved skins are sold at from eight annas to one rupee. They are snared with horse-hair nooses by the Madras fowlers.'

In Travancore Ferguson considered it fairly common throughout the low country wherever there are reedy marshes. He also often flushed it from paddy fields. Three specimens from the Vellarney Lake (Fry) are in the British Museum. In this state Stuart Baker (*Game Birds*, ii, 124) considers it to breed up to 3,000 ft. In Cannanore it is evidently fairly plentiful as Captain Wall killed 32 in December, January and February of the shooting season 1903-4 (*J.B.N.H.S.*, xv, 722). From here it extends sufficiently up into the hills to reach the Wynaad, whence William Davison records it. Whether it may be included in the Nilgiri list is doubtful.

The Painted Snipe is in the main doubtless a resident species in the Presidency but it must move about locally in accordance with the distribution of the water supply and there may be also more definitely migratory movements, as in Ceylon it is apparently an immigrant about October.

Our information about the breeding season in the Presidency is far from complete. In Travancore Ferguson received eggs in December and young in

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February. At Coimbatore Captain Packard found a shelled egg in a bird sent to the table in October (*J.B.N.H.S.*, xv, 139) and further north a Mr. Hadfield found an oviduct egg in January (*S.F.*, x, 414). This evidence suggests that a sufficient number of Painted Snipe breed in the cold weather to justify one in asking sportsmen to spare what is at best a most indifferent game bird.

There is no difference between birds from North and South India.

[**Grus grus lilfordi** Sharpe.

Grus lilfordi Sharpe, Cat. Birds Brit. Mus., vol. xxiii (1894), p. 252—R. Jhelum near Jelalpur, Punjab.

In Hume and Marshall, iii, p. 21, Major Campbell of the 26th M. N. I. writes from Quilon that the Common Crane is not uncommon in Travancore, but this statement has never been confirmed and is on the face of it unlikely.

When describing this species Sharpe neither designated a type nor a type locality. He described an adult male, and as only two such were in the British Museum collection and both from the Punjab, one must be the type, and we have selected the first which came from River Jhelum, near Jelalpur.]

Antigone antigone antigone (Linnaeus).

Ardea antigone Linnaeus, Syst. Nat., ed. x, vol. i (1758), p. 142—East Indies.

I have no knowledge regarding the occurrence of the Sarus Crane in the Presidency beyond Hume's statement (*Game Birds*, iii, p. 1) that it occurs in the Madras Presidency north of the Godavery and perhaps between the Kistna and the Godavery. It was not reported by the Survey.

Anthropoides virgo (Linnaeus).

Ardea virgo Linnaeus, Syst. Nat., ed. x, vol. i (1758), p. 141—Numidia.[1]

The only record of the Demoiselle Crane in the Presidency will be found in Hume and Marshall (iii, 31-38) where Albert Theobald is said to have seen it in the neighbourhood of Kollegal in the north of Coimbatore district and to have had reports of it from as far south as Tinnevelly. About Kollegal Mr. Theobald states that they appear in the latter part of December viz. about harvest time and leave by the end of February or early in March. In that neighbourhood in his time a certain measure of sanctity was attached to the bird.

Choriotis nigriceps (Vigors).

Otis nigriceps Vigors, P.Z.S. 1830-31 (2 March 1831), p. 35—Himalayas.[2]

According to Jerdon the Great Indian Bustard is—or was—found in the Carnatic and there is a specimen in the Madras Museum which is said to have been killed locally. Another specimen, in the Museum of St. Joseph's College, Trichinopoly, was killed by native fowlers at Samajapuram, 10 miles north of Trichinopoly on 25 February 1924. This was a full grown male (Father Leigh, *J.B.N.H.S.*, xxx, 225). In this area they must have been fairly common at one time as Major Charles A. Tostems (*S.F.*, x, 167) records that he shot one three miles west of Arupacottah, a large village in the Madura district on the Tinnevelly border. It was one of a party of seven or eight and he says that he had repeatedly seen eight or ten of a morning near the same place. Writing as if they were well known birds he adds:—the Bustard came to these plains (in Tinnevelly and Madura) about September and October. The same writer goes on to say that to the north of the Carnatic these Bustard are often to be had in the cold weather in the Kurnool district.

A successful stalk at Tugalli in Kurnool when three birds were secured from a party of six in January 1896 is described by Major R. W. Burton in Stuart Baker's *Game Birds*, vol. ii, p. 179.

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[1] For type locality see Grant, *Bull. B.O.C.*, lv, No. ccclxxxii (January 1935), p. 65.

[2] See *Ibis* 1924, p. 470, for a discussion of this type locality.

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As this wonderful bird is, I fear, doomed to extinction before long, one can only hope that all sportsmen who have met with it or shot it in the past will record their experiences in some detail in the *Journal*. The historian of the Great Bustard in England deplores the paucity of his material and would give anything for the information which numbers could have recorded had they realised the birds' approaching doom.

Sypheotides indica (Miller).

Otis indica Miller, Icones Anim. (1782), p. 6, pl. 33—India Orientali.

Not procured by the Survey. I have been able to trace a fair number of records of the Likh in the Madras Presidency though these, no doubt, do not give a full picture of its status and distribution. Jerdon says it is found in the Northern Circars and Stephen Cox (*J.B.N.H.S.*, xii, 575) saw one shot at Razan in Waltair District. There are fuller records for Cocanada and Rajahmundri. Near the former place Major Charles MacInroy says that he has known four or five killed in a morning at Samulcottah, a deserted cantonment (*N. & E.*, viii, 492). Major Charles A. Tostems (*S.F.*, x, 168) says that he had shot 3 or 4 of a morning in December and January at Rajahmundri —Cox also knew of it being shot in the Godavery district—and mentions as very unusual the capture of a female in June by a native shikari. Further south at Ongole in Nellore district he considered the bird common.

In the Carnatic generally Jerdon considered the Likh chiefly a winter visitor. About Madras Dewar called it not at all common, quoting a Mr. Cross who though shooting regularly rarely killed more than a single bird a year. There is a local specimen in the Madras Museum, and four specimens labelled Madras with no definite data are in the Wardlaw-Ramsay and Hume collections in the British Museum. Further south Jerdon states that he had found the nest in October near Trichinopoly.

The western side is not very suitable to its requirements but a single specimen was killed on the slopes of the Nilgiris some years before 1887 between Neddivattum and Pykara (Hume, *S.F.*, x, 412).

In Travancore Ferguson only knew of a single record, a bird shot in some rushes near Trivandrum in 1876.

Burhinus oedicnemus indicus (Salvadori).

Œdicnemus indicus Salvadori, Atti Soc. Ital. Sc. Nat., vol. vii (1866), p. 381—India.

Specimens collected:—117 ♀ 23-4-29 Kurumbapatti; 453 ♂ 20-6-29 Tirthamalai 1,000 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	42.5	203	109	73.5 mm.
1 ♀	40	203	103	74.5 mm.

There are a few records of the Stone-Curlew on both sides of the Presidency. On the east Rhodes Morgan shot a female in May in Kurnool and found a coloured egg in the oviduct as described in *N. & E.*, iii, 333. A specimen from Singaperumal Koil, Chingleput district, is in the Madras Museum. The two Survey specimens complete the records on this side. No. 117 contained an egg almost ready to lay.

On the west William Davison collected a female at Segore on 18 February 1881 which is now in the British Museum and Major Phythian Adams informs me that he took c/2 eggs, almost fresh, near Kollegal in N. Coimbatore on 21 July 1935.

As regards Travancore Ferguson says:—I have on more than one occasion seen and shot this bird when snipe-shooting at Valey, 4 miles from Trivandrum, where the soil is sandy and the place is clothed with shrubs and cocoanut trees. They were sometimes in small parties of three or four; at other times solitary. Breeds here in August.

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Esacus recurvirostris Cuvier.

Œdicnemus recurvirostris Cuvier, Règne Anim., 2nd ed., vol. i (1829), p. 500—India.

Not procured by the Survey. While the Great Stone Plover probably occurs on all the suitable rivers of the Presidency I have only actual record of its occurrence in three localities. Mr. H. C. Smith, I.F.S., kindly informs me that he found a newly hatched chick at Masulipatam on 16 April 1918. Mr. H. R. S. Hasted saw at least 12 old birds and found a chick on the Kistna River in Kurnool. The date is given as 29 June 1909 but there may be some mistake as Mr. Hasted was apparently out snipe-shooting (*J.B.N.H.S.*, xx, 221). There is a local specimen in the Madras Museum. The bird is doubtless a resident as in other parts of its range.

Cursorius coromandelicus coromandelicus (Gmelin).

Charadrius coromandelicus Gmelin, Syst. Nat., vol. i, pt. ii (1789), p. 692—Coromandel Coast.

Not procured by the Survey. The Indian Courser is only recorded as occurring in two areas in the Presidency. The first is near Madras as there is a local specimen in the Government Museum and three specimens from Madras—apparently meaning the capital—are in the Hume and Wardlaw-Ramsay collections.

In Travancore Ferguson says his collector shot two in June 1902 in some sandy plains 8 miles south of Quilon. Four more were subsequently obtained 12 miles south of Quilon and as these included a very young bird Ferguson concluded that the species must breed in this area. He was doubtless right as Stuart Baker (*Nidification*, iv, 345) says, on the authority of Stewart, that this Courser is common in the deforested areas of Travancore, breeding from May to July.

The scientific name is given trinomially as in my opinion *Cursorius temminckii* Swainson, 1822 is merely an African race of the Indian Courser.

Rhinoptilus bitorquatus (Blyth).

Macrotarsius bitorquatus Blyth, J.A.S.B., vol. xvii (1), 1848, p. 254—Eastern Ghats.

'This remarkable Plover has hitherto, I believe, only been procured by myself,' said Jerdon in his *Birds of India*, 'from the hilly country above the Eastern Ghats, off Nellore and in Cuddapah.' He appears to have left no further record of the exact locality, the date or the number of birds seen, though he gave a few details of behaviour and the bird was not reported again until Blanford saw three in open forest 15 miles east of Sironcha (*Ibis* 1867, p. 462 and *J.A.S.B.*, 1869, p. 190). Later Blanford obtained two males on the 5th and 9th March 1871 near Badrachalam north of the Godavery. These two specimens are in the British Museum. Since then an anonymous writer in the 'Asian' is said to have found the eggs and Howard Campbell is said to have procured a male near Anantapur (*New Fauna*, vi, p. 88) but these original references I have failed to trace.

The above is a brief epitome of all that is known about the occurrence and distribution of Jerdon's Courser not only in the Presidency but in the whole of India and the rarity and limited range of this Indian member of an African genus make it one of the most interesting birds on the Presidency list. Mr. LaPersonne in this Survey and Mr. Salim A. Ali in the Hyderabad Survey (*J.B.N.H.S.*, xxxvii, 443) made special efforts to find the bird again but without success.

[Glareola pratincola maldivarum Forster.

Glareola (*Pratincola*) *maldivarum* Forster, Fauna Indica (1795), p. 11—Maldive Islands.

Baker and Inglis include the Large Indian Pratincole in their account of the Birds of South India, no doubt on account of the fact that it breeds in small colonies in Ceylon. There is, however, so far as I am aware, no record of its occurrence in the Presidency.]

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Glareola lactea Temminck.

Glareola lactea Temminck, Man. d'Orn., 2nd ed., vol. ii (1820), p. 503—Bengal.

Specimens collected:—1275 ♂ 20-1-30, 1285-1288 ♀♀♂♀ 21-1-30, 1290 ♀ 22-1-30, 1291 ♀ 1298 ♀ 23-1-30 Godavery Delta.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	15	156.5-160.5	56-58.5	22-22.5 mm.
6 ♀	14.5-15.5	143-156.5	50.5-58.5	22-22.5 mm.

The Little Indian Pratincole was only obtained by the Survey in the Godavery Delta in January. Here they appeared about sunset in flocks of 30 or 40 birds which flew about over the tree tops of the island, where the Survey was encamped, feeding in the air and descending after sunset to skim over the surface of the water. The females had their ovaries slightly enlarged.

It had been previously recorded in the west of the Presidency. Ferguson says that he only received it from North Travancore where flocks consisting of a dozen or more were met by his collectors at Velyani near Alwaye, frequenting the open flats on either side of the Alwaye River up to Malayaltur.

Sir A. Cardew found it breeding on the sandy banks of a river at Mangalore in April.

There is no difference between birds from North and South India.

Dromas ardeola Paykull.

Dromas ardeola Paykull, K. Vet.-Ak. Nya Handl., vol. xxvi (3), 1805, p. 182—India.

The only information which I can find about the distribution of the Crab-Plover in the Presidency is Jerdon's statement that he found it on the east coast near Nellore, far from rare at the mouths of rivers and along back-waters. It was in small flocks and observed 'during the hot weather, as well as at other times'. A specimen in the Madras Museum is said to have been obtained locally. As it is fairly common on the north coasts of Ceylon it is doubtless also to be found on other parts of the Presidency coast.

(To be continued).

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A NEW RACE OF HORSFIELD'S SCIMITAR-BABBLER.

BY

H. WHISTLER, F.Z.S., M.B.O.U.

In the Eastern Ghats Survey (*J.B.N.H.S.*, xxxv, 742) I discussed the difficulties inherent in a study of the races of Horsfield's Scimitar-Babbler (*Pomatorhinus horsfieldii*) and pointed out that birds obtained from the Lower Eastern Ghats (Kurumbapatti, Shevaroy Hills, Palkonda Hills, Nallamalais) differed from those of the rest of India in having short beaks (29-31·5 mm.) and in lacking the black edge to the white plastron. At the time however I was loath to add to the races of this species on the material before me. In the Hyderabad Survey (*J.B.N.H.S.*, xxxvi, 375) I returned to the subject, pointing out that the three specimens obtained by Mr. Salim Ali at Ferahabad 2,800 ft. on the Amrabad Plateau, which is physically little but a continuation of the Nallamalais, agree with the series from further south. I suggested then that this south-eastern race appeared worthy of a name as its characteristics though slight in character appeared to be correlated with a sharply defined distribution.

Since the above was written I have examined a fine series of Horsfield's Scimitar-Babbler collected by the interest of Mr. R. C. Morris in the Billigiri-rangan Hills. These birds are all long-billed (30-33 mm.) and have a marked black edge to the plastron and evidently belong to the typical race, being sharply defined from *P. h. travancoreensis* of the western coast and the birds under consideration from the Eastern Ghats. As this fact emphasises the definition of the characteristics and range of the Scimitar-Babbler of the South-Eastern Ghats, I now desire to give the latter a name and propose to call it

POMATORHINUS HORSFIELDII MADERASPATENSIS subsp. nov.

Type: Vernay Survey No. 122 ♂ 24 April 1929 Kurumbapatti, Salem District (now in the British Museum).

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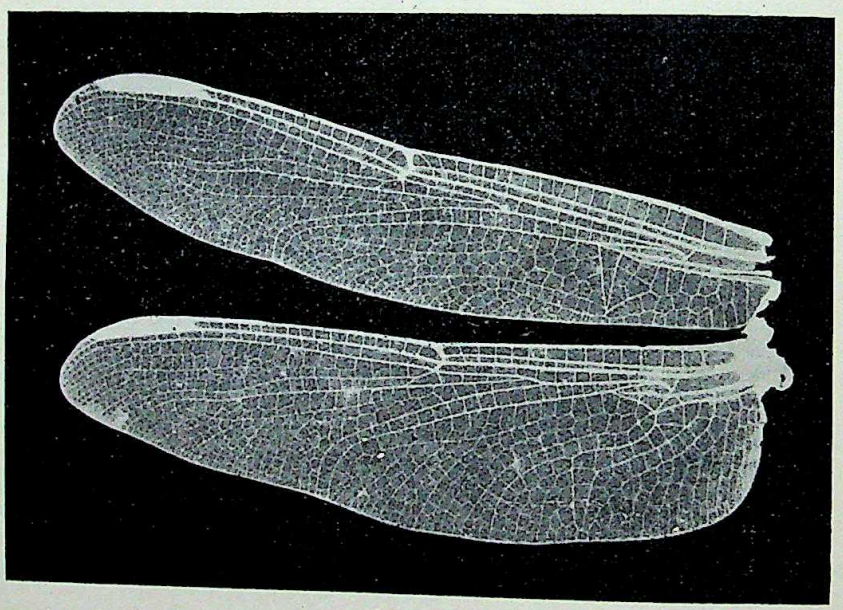
NEW ORIENTAL DRAGONFLIES.

BY

F. C. FRASER, *Lt.-Col.*, I.M.S. (Retd.), F.R.E.S.

(*With a text-figure*).

Dr. F. F. Laidlaw has passed on to me three species of dragonflies for description, two of which are new to science and the third, the hitherto undescribed female of *Idionyx dohrni* Kruger.



Wings of *Protorthemis intermedia* sp. nov.

Male. Abdomen 33 mm. Hindwing 42 mm.

Head: labium and anteclypeus ferruginous; labrum, rest of face and frons dark reddish-brown; occiput almost black. Prothorax and synthorax reddish-brown changing to blackish-brown on middorsum. Wings hyaline; antenodal portion of costa of forewing distinctly longer than the portion from node to apex (this portion decidedly shorter in all other species); subtrigone of forewing made up of 5 cells; hypertrigones traversed once or twice; discoidal cell of forewing 3-celled, traversed once in the hindwing; discoidal field forewing beginning with a row of 4 cells and then continued for a short distance as rows of 3 cells; supplementary nervures present in Bridge; anal loop extending 4 cells beyond distal end of discoidal cell. Membrane dark-brown. Legs reddish, distal ends of femora and tibiae and tarsi black. Anal appendages simple, finely denticulate beneath, reddish-brown. Genitalia closely similar to those of *P. celebensis*.

Habitat: Palawan. A single male only, which will be deposited in the British Museum as the type. The relative lengths of the antenodal and post-nodal portions of the forewing will serve to distinguish this species from all others of the genus.

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Idionyx dohrni Kruger.

Female: Abdomen 30 mm. Hindwing 31 mm.

The female has not been described: it resembles the male very closely in colour and markings. The vesicle is not specialized but is rather flattened and rounded at the apex. Wings hyaline, uncoloured; anal-loop 9-celled; only one row of cells between the origins of *Cuii* and *IA* in the hindwing; 14-15 antenodal nervures in forewing, 7 postnodal; 8-10 antenodal and 8 postnodal nervures in hindwing.

Habitat: Perak, F.M.S., Jor Camp, 2,000 ft., coll. 3. Seimund, 22, viii, 22. The female of this species closely resembles that of *I. imbricata* but the wings are uncoloured at the base and the anal-loop is shorter.

Idionyx laidlawi sp. nov.

Female. Abdomen 31 mm. Hindwing 34 mm.

Head: labium, labrum and rest of face including the lower part of frons dark ochreous; upper part of frons and the vesicle metallic blue; the latter conical, rising steeply, its apex tapered finely and bearing a small horse-shoe ridge at its summit which encloses a tiny notch behind, whilst below it, on the posterior aspect of the vesicle, there is a small but stout spine. Occiput black. Prothorax and thorax metallic blue marked with short antehumeral yellow stripes extending only halfway up the dorsum, and with two oblique citron yellow stripes on each side, one medial, the other bordering the metepimeron posteriorly. Beneath yellow, marked with three large oval submetallic dark spots. Wings hyaline, uncoloured; pterostigma black; membrane pure white; anal-loop made up of 10 cells; 2 cubital nervures in hindwings; only a single row of cells between the origins of *Cuii* and *IA* in the hindwing; 13 antenodal and 7-8 postnodal nervures in forewing, 9 antenodal and 10-11 postnodal nervures in hindwing. Abdomen black, unmarked, segments 8 to 10 slightly dilated and depressed; vulvar scale triangular, projecting conspicuously in profile. Legs black but the two hinder pairs of tibiae bright yellow on the flexor surface. Male unknown.

Habitat: Pahang, Malay Peninsula. A single female, the type, from Fraser's Hill, 4,200 ft., 3-6-21, collected H. M. Pendlebury. This species is easily determined by the highly specialized shape of its vesicle which approaches that of *I. intricata* Fras., but has a posterior spine which is absent in the latter. It appears to be closely related to this species and belongs, with it, to the *optata* group. The type will be placed in the British Museum.

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FRESHWATER FISH AND FISHERIES OF TRAVANCORE.

BY

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(Department of Zoology, Agra College, Agra).

(With 5 text-figures).

CONTENTS.

Introduction	702
Geography	704
List of Freshwater fish and their local names	706
Systematic description of the Freshwater fish of Travancore	708
Methods of capture	716
Factors injurious to the development of Freshwater Fisheries	722
General considerations	728
References	732

INTRODUCTION.

The materials for this paper were obtained during the years 1932 and 1933 when I had the opportunity of spending some months in Travancore. To get a fairly accurate idea of the seasonal distribution of the various types of fish, it was necessary to make collections during different seasons. Accordingly the first collection was made three weeks before the commencement of the South-West Monsoon and another, two weeks after the commencement of the rains. The third collection was made during October and November. The first and second collections were made personally by me both in the hilly regions and the plains, but for the October and November collections, I depended mostly on the help rendered by friends in different parts of the country. As already stated, these three collections were planned with the object of obtaining a more or less general idea of the seasonal distribution of the freshwater fishes. The first collection is I believe fairly representative of summer conditions, when in the plains, rivers and canals are stagnant and at their lowest levels and streams in the hills are partly dry and broken up into puddles and pools, connected only by narrow and irregular channels. The second collection gives some idea of the fish obtainable during the rainy season, while the third represents the condition of the fisheries during the cold season. The author is fully aware of the fact that three hurried collections by themselves are not sufficient to give a perfectly accurate idea of the seasonal distribution of fish, even of a very narrow tract of country, but it is hoped that this work will more or less form a preliminary account, which may stimulate other workers permanently settled in the country to make a more comprehensive and thorough study of the subject.

Judging from the list of vernacular names of fishes supplied by local residents in different parts of the State I presume that

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there is still a large number of species unrecorded. For instance in Thodupuzha (one of the Taluks of the State), I was informed that the type commonly called '*Vakameen*' (one of the *Ophiocephalidae*) is represented by at least two distinct varieties, which I had not succeeded in getting. Their vernacular names were *Arivaka* and *Pandavaka*. In other places people gave me names of fish, such as *Katti*, *Kathi*, *Kuilkathi*, *Chekada*, *Kadimeen*, *Vazutha*, *Kooral*, *Chenkanian* and *Vellivala*, which I have not been able to correlate with the specimens I had collected, and, by way of explanation, I was informed that these varieties were not available during the particular season when I visited those places. It is impossible, with the present state of our knowledge, to say whether these names are synonymous with other names which I have recorded or whether they are really types which I did not succeed in getting, owing either to their rarity or absence during certain seasons.

One great difficulty in the way of arriving at any positive conclusion in this matter is the fact that the same fish is known by different vernacular names in different localities. The vernacular names of fishes in South Travancore have been compiled by Shankeranarayana Pillay (1929) and these names resemble the Tamil names. In the northern parts of the State, the same fishes are known by different names. As these parts of the country are completely isolated from Tamil influence, the names prevalent here may be safely regarded as the Malayalam names. Even in these northern parts, the name of the same fish changes from place to place. For example, according to Shankeranarayana Pillay, *Mastacembelus guentheri* is known as *Kal-aural* in South Travancore. The same fish is called *Arakan* in places round about the little market town of Changanacherry, while it is called *Pazhukkamundi* in the hilly regions of Moovattupuzha and Thodupuzha taluks. The variable and indefinite nature of these vernacular names prevailing within narrow limits shows how great are the difficulties which confront the worker who attempts to discover vernacular names of even the commonest food fishes of the country.

A fairly representative collection of fishes were brought to Madras for purposes of identification and they are now preserved at the Madras Government Museum.

In conclusion I wish to record my deep sense of gratitude to Dr. F. H. Gravely, Superintendent of the Madras Government Museum, for kindly allowing me the use of collecting equipment and for permitting me to carry on the work of identification in the Zoology Department of the Museum. My thanks are also due to Mr. Chinnappiah, Zoological Assistant of the Government Museum, for his valuable help and suggestions during the progress of this work. However, soon after I began this work I was appointed to the Agra College and so I got through the identification in a hurry, using only Day's volumes on Fishes, in the *Fauna of British India series*. References giving more recent nomenclature are not available at Agra, hence it was not possible for me to make the systematic description more uptodate. It has already been pointed out to me that some of my identifications

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are open to doubt. I do not challenge such a criticism as I have no facilities to verify my observations, as I am far away from the place, where the material is available. However, in such a paper as this, though the systematic description is not the essential aim, it forms an indispensable part, since it is the only medium through which the habits and economic importance of the various types of fish can be adequately described, and that purpose will be achieved whatever the system of classification adopted.

Geography.

For the proper appreciation of the scope of fisheries in a country it is essential to have a general idea of its geographical features, as the possibilities of fisheries development can be gauged only from this aspect.

Travancore, a name derived from the Malayalam word, which means the 'abode of the Goddess of Prosperity', is a land which certainly justifies its name, being perhaps one of the most beautiful and fertile areas in the southern part of India. The great diversity of the physical aspects of the country, with its 'mountainous amphitheatre, sylvan slopes, sequestered glens, rich and variegated valleys embellished with foaming torrents', its flat coastal plains with extensive cocoanut plantations and waving expanses of paddy fields, presents a picture unique in the whole of India.

Travancore lies in the extreme south-west of Peninsular India between 8° 4′ and 10° 21′ N. and 76° 14′ and 77° 73′ E.; and derives great advantage from the fact that it is flanked by a continuous range of hills along its eastern boundary. The northern and eastern parts spread out in a plateau of considerable width. Towards the coast these ranges soften down into undulating slopes which finally melt into the narrow strip of flat fertile coastal plain. The total area of the State is 7,625 sq. miles, of which 5,778 sq. miles or nearly three-quarters, comprise the highlands and the rest, 1,847 sq. miles, forms the coastal plains.

The Western Ghats extend into the north-eastern part of Travancore and reach their highest elevation in the Anamudi peak. The numerous hills clustering round this part are collectively called the 'High Ranges'. South of this there is a chain of hills called Cardamom Hills. From this main chain of ranges, rocky spurs forming secondary ranges run out towards the west and in certain places reach the coast. These chains of ranges are separated by innumerable valleys enclosed within an ocean of forests, through which run streams, rivulets and rivers, roaring in a mad rush to reach the plains below.

The chief mountain ranges according to their vernacular names are Anamudi Hills, Agasthyakootam, Mahendragiri, Mottachimala, Pirmed, Ponmudi, Elamala and Sabirimala. As already stated, this chain of ranges collectively called Anamudi Hills and Cardamom Hills form a broad plateau, from the bosom of which a few rugged cliffs and spiry points break through the undulating contour and reach altitudes ranging from 4,000 to 8,000 ft. above

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sea level. These mountain ranges standing like a wall behind a narrow coastal plain covered with exuberant vegetation check the rain-bearing winds blowing directly against them from the Indian Ocean. This gives Travancore its greatest natural advantage. The rainfall is heavy. The South-West Monsoon, which brings the greatest quantity, falls between May and August. The North-East Monsoon commences at the end of October. The maximum annual rainfall is about 200 inches.

Owing to the mountainous character of the country and the heavy rainfall both during the summer and winter months, there are numerous rivers and streams all over the country. There are twelve main rivers and these in the order of succession from north to south are: (1) Periyar, (2) Moovattupuzha river, (3) Meenachil river, (4) Pambayar, (5) Kallada river, (6) Attungal or Vamana river, (7) Karamana river, (8) Killiyar, (9) Neiyar, (10) Thambravarni river, (11) Kothayar and (12) Vadacherry river. The northernmost river—the Periyar—is the longest and as we proceed southwards they become smaller and smaller and the southernmost one is only a small rivulet hardly about 25 miles long. The Periyar is 142 miles in length and rises in the Sivagiri forests about 60 miles from Devikulam at an elevation of 3,000 ft. About seven miles west of a place called Mullaperiyar the river runs through a narrow gorge steeped on both sides by high hills. The construction of a dam at this point has caused water to accumulate into a big freshwater lake, from which water is diverted to the adjoining British territory for irrigation purposes.

All the rivers generally have a winding course and they empty themselves either into the system of lakes described below or directly into the sea.

Along the coast, a chain of lakes extends from the borders of Cochin to Trivandrum. These lakes are extensive sheets of water into which one or more rivers flow. A few of these lakes are connected permanently with the sea, while others are separated from the sea by a bar of sand. The rivers which flow into these lakes deposit large quantities of alluvium and, as a result, the lakes are rather shallow and in certain parts, especially in the Vembanad lake, these shallows are enclosed by bunds and used for paddy cultivation. Proceeding northwards from Trivandrum, the lakes in their order of succession are: Velikayal, Katinamkulam, Anchuthengil Kayal, Nadayar, Paravur lake, Ashtamudi, Kayamkulam lake and Vembanad lake. Of these eight lakes, Vembanad, Kayamkulam and Ashtamudi lakes are important. The Vembanad lake is nearly thirty miles long and nearly ten miles across at its broadest part. Though the Ashtamudi lake is only ten miles long, it is one of the most beautiful lakes in India. Apart from its natural beauty, it affords important fisheries to the country and popular belief maintains that fishes found in certain parts of this lake are delicious.

In addition to the lakes mentioned above, in which the water is either saline or brackish, there are a few freshwater lakes, the three largest being, Vellani, near Trivandrum, Sasthankotta, in the Kunnathur taluk, near Quilon, and the Periyar lake. Thazakudi

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tank in Thovala taluk and Mekottu tank in Kalkulam taluk may also be brought under this category.

From the above account it will be seen that Travancore is ideally suited for developing both sea and freshwater fisheries. Nowhere in India is there another State or Province which is so well suited to the development of fisheries. The possession of a shallow coastal sea, which affords excellent fishing grounds for Sardine and Mackerel fishery, the presence of a beautiful chain of lakes and a system of deep and perennial rivers intersecting the country with a net-work of canals, combine to afford the best facilities for developing this source of revenue to the State and a substantial and steady income to the people.

LIST OF FRESHWATER FISHES AND THEIR LOCAL NAMES.

Serial No.	Scientific Name	Local Name
1	*Anguilla bicolor* ...	Valangil, Manangu (C.T.).
2	*A. vulgaris* ...	Kuruttu-vilangu (T.).
3	*Clarias magur* ...	Yeri-vahlay (T.).
4	*Saccobranchus fossilis* ...	Kaari (C.T.), Theyli (T.).
5	*Wallago attu* ...	Vahlah (C.T.).
6	*Callichrous bimaculatus* ...	Chotta-vahlah (C.T.).
7	*C. malabaricus* ...	Manja-vahlay (T.), Chotta-vahlah, Thamma (C.T.).
8	*Pseudotropius sykesii* ...	Naui-kelithi (T.).
9	*Macrones chryseus* ...	Manja-koori, Eatta-koorie (C.T.), Moongil (T.), Mungil yata (D.).
10	*M. gulio* ...	Vellah-koorie, Changan-koorie (C.T.), Kadel-kelithi (T.).
11	*M. oculatus* ...	Koorie (C.T.), Theydoo (T.).
12	*M. vittatus* ...	Chillan (C.T.), Kallen-koorie (T.)
13	*M. montanus* ...	Vari-kallan-koorie (T.).
14	*M. malabaricus* ...	Kallan-koorie (T.).
15	*Nemachilus botius* ...	Attu-meen (T.).
16	*N. triangularis* ...	Kal-kanni (T.).
17	*Homaloptera maculata* ...	.....
18	*Discognathus jerdoni* ...	Koravai (T.).
19	*D. jerdoni* ...	Kal-nakki (T.).
20	*Labeo dussumieri* ...	Toolee (C.T. & D.).
21	*Amblypharyngodon mola* ...	Oolari (T.).
22	*A. microlepis* ...	.....
23	*A. melettina* ...	Airay (T.), Thuppalu-kothi (C.T.), Wumboo (D.).
24	*Barbus sarana* ...	Kuruvah (C.T.).
25	*B. pinnauratus* ...	Panchala-kylie (T.).
26	*B. tor* ...	Nari-meen (C.T.).
27	*B. curmuca* ...	Kadi-meen (C.T.).
28	*B. lithopidos* ...	.....
29	*B. melanampyx* ...	Kylie (T.).
30	*B. parrah* ...	Parrah-parlee (D.), Kylie (T.).
31	*B. burmanicus* ...	Sappauli-kendai (T.).

The letter 'T.' after the vernacular names indicates that these names are prevalent in the Tamil-speaking part of Travancore (south of Trivandrum) and were first recorded by Shankeranarayana Pillay (1929); the letters 'C.T.' indicate that they are the real Malayalam names prevalent in the central and northern parts of Travancore; and the letter 'D.' indicates that they are the Malayalam names given by Day in the *Fauna of British India*. Except in

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LIST OF FRESHWATER FISHES AND THEIR LOCAL NAMES—(*contd.*)

Serial No.	Scientific name	Local Name
32	*Barbus denisonni* ...	Kendai (C.T.).
33	*B. melanostigma* ...	Kendai (T.).
34	*B. amphibius* ...	Oolee-parlee (D.), Urulen-kendai (T.).
35	*B. arulius* ...	Kendai (T.).
36	*B. mahecola* ...	Poovaulen-kendai (T.), Kuruvah-paral (C.T.).
37	*B. conchonius* ...	.....
38	*B. punctatus* ...	Vattakkali (C.T.), Putter-perlee (D.).
39	*B. stigma* ...	Unda-kanni (T.).
40	*B. vittatus* ...	Cheli-kuthi (C.T.).
41	*B. filamentosus* ...	Kachi-paral (C.T.).
42	*Rasbora daniconius* ...	Kokanutchee (D.), Parava-kendai (T.).
43	*R. nilgiriensis* ...	Parava-kendai (T.).
44	*Rohtee bakeri* ...	Mullan-paral (C.T.).
45	*Danio malabaricus* ...	Cheela-pauray (T.).
46	*Perilampus laubuca* ...	.....
47	*Chela boopis* ...	.....
48	*Megalops cyprinoides* ...	Mullan-kanni, Palan-kanni (C.T.), Nanchil (T.).
49	*Haplochilus lineatus* ..	Manathu-kanni (T.).
50	*H. rubrostigma* ..	Poonjan (C.T.).
51	*Belone cancila* ...	Kolah (C.T.).
52	*Hemiramphus xanthopterus* ..	Murasu (C.T.).
53	*Ambassis thomassi* ...	Mullu-cheru (C.T.).
54	*A. nalua* ..	Sennel (T.).
55	*A. dayi* ..	Nandhan (C.T.).
56	*A. gymnocephalus* ..	Nandhan (C.T.).
57	*Gerres limbatus* ...	Prachil, Kootha-prachil (C.T.).
58	*Nandus marmoratus* ..	Mudhu-kolah, Mudhukala (C.T.), Mootahree (T.) & (D.).
59	*Pristolepis fasciata* ..	.....
60	*P. malabarica* ..	Kalluringee (T.), Chempalli (C.T.), Chutichi (D.).
61	*Gobius striatus* ...	Kadel uluvay (T.).
62	*G. giurus* ..	Poonthy (T.), Wartee-poolah, Pooan and Kurdan (D.).
63	*Mastacembelus armatus* ..	Mookan-arakan, Pana-arakan (C.T.), Kal-aural (T.).
64	*M. guentheri* ...	Arakan, Pazhukkamundi (C.T.), Kal-aural (T.).
65	*Ophiocephalus marulis* ...	Choaree veral and Curavu (D.), Poo-viral (C.T.) & (T.).
66	*O. leucopunctatus* ...	Pulli-viral (T.), Cheru-meen (C.T.).
67	*O. micropeltis* ...	Karuvauhay (T.), Vaaha-meen (C.T.).
68	*O. striatus* ...	Viraal (T.), Vharaal (C.T.), Wara-hal (D.).
69	*O. gachua* ..	Para-koravai (T.), Manathu-kannan, Vattoon (C.T.), Karavu (D.).
70	*Anabas scandens* ...	Kallada-mutti, Undeecallee (C.T.), Undeecollee (D.).
71	*Polycanthus cupanus* ...	Caringannah (C.T.) & (D.).
72	*Etroplus suratensis* ...	Chauni-kendai (T.), Karimeen (C.T.).
73	*E. maculatus* ...	Setha-kendai (T.), Pallathi (C.T.) & (D.).

three cases, i.e. Undeecollee, Caringannah and Pallathi, the Malayalam names given by Day are not understood in any part of Travancore. Probably they are the names commonly used in British Malabar.

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Systematic Description of the Freshwater Fishes of Travancore.

Order: *SYMBRANCHOIDEA.*

Family: Symbranchidæ.

Anguilla bicolor, McClelland.

Anguilla bicolor, McClelland, *Calcutta Jour. Nat. Hist.,* v, p. 178.
Anguilla bicolor, Day, *Faun. Brit. Ind., Fish,* i, p. 87.

This fish is of a dark olive colour, becoming yellowish beneath, and is commonly found in the central part of Travancore. In the hilly regions it usually lives in crevices, between boulders, along the banks of rivers; while in the plains, it frequents rivers, which are somewhat marshy.

A. bicolor is supposed to have certain medicinal properties and is usually recommended as diet to people suffering from piles. However it is not very much esteemed as food by the better classes.

Order: *OSTARIOPHYSI.*

Family: Siluridæ.

Clarias magur, Day.

Clarias magur, Day, *Faun. Brit. Ind., Fish,* i, p. 115.

Usually found in the regions round about Trivandrum, and I was not able to find any specimens of it in the northern part of the State. It is not of any economic importance and is only eaten by the poorest sections of the population.

Saccobranchus fossilis, Day.

Saccobranchus fossilis, Day, *Faun. Brit. Ind., Fish,* i, p. 125, fig. 53.

Usually found in marshy regions in the plains. Fishermen are afraid of handling it, since it is believed that its pectoral spine is very poisonous and that wounds inflicted by it cause excruciating pain. It is not much esteemed as food owing to its foul feeding habits, and in certain parts it is regarded as a scavenger and is eaten only by the poorest classes.

Wallago attu, Schn.

Wallago attu, Day, *Faun. Brit. Ind., Fish,* i, p. 126, fig. 54.
Wallago attu, Vinciguerra, *Ann. Mus. Stor. Nat., Genova* (2), ix, p. 199.

A very cosmopolitan fish, much esteemed as food especially by the Christian section of the population. It has a wide distribution and is found abundantly in Kuttanad, where it is usually caught by the *airam choonda,* a device which is described elsewhere. In the hilly regions, during February, March and April, when the streams and rivers are partially dry it is usually caught by poisoning streams.

Callichrous bimaculatus, Bloch.

Callichrous bimaculatus, Day, *Faun. Brit. Ind., Fish,* i, p. 131, fig. 57.
Callichrous bimaculatus, Vinciguerra, op. cit., p. 201.
Ompok bimaculatus, Jerdon and Starks, *Ann. Carnegie Mus.,* xi, p. 434.

Specimens of this species have been recorded from Cape Comorin. They are silvery-white in colour with a black blotch on either side above the pectorals. The single specimen which I obtained was 8 in. long.

Callichrous malabaricus, Cuv. & Val.

Callichrous malabaricus, Day, op. cit., p. 133.

Found all along the Malabar coast south of Canara. In Travancore it is found usually in the plains during the rainy seasons. Reaches a maximum length of 18 in.

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Pseudotropius sykesii, Day.

Schilbe sykesii, Jordan, *Mad. Jour. L. Sc.*, xv (1849), p. 335.
Pseudotropius sykesii, Day, op. cit., p. 140.

A small fish not exceeding 6 in. in length. Rather rare in the northern half of the State. Back bluish green, sides and abdomen silvery. The upper jaw is slightly longer and the palate contains two distinct patches of teeth.

Macrones chryseus, Day.

Pseudobagrus chryseus, Day, *Fish. Malabar*, p. 185.
Macrones chryseus, Day, op. cit., p. 148, fig. 63.

Recorded both from hilly regions and plains. One of the commonest species in Travancore, found in all the deep rivers and canals. It is a small fish, not exceeding 7 or 8 in. in length, and it is considered to be good for cooking.

Macrones gulio, Day.

Pimelodus gulio, Ham. Buch., *Fish. Ganges*, pp. 201, 379.
Macrones gulio, Day, op. cit., pp. 151-3, fig. 64.

In Trivandrum this fish is called *kadel-kelithi*, a name which indicates that it migrates into brackish and freshwater from the sea. Very abundant in brackish water lakes along the coast, which communicate with the sea and from them it ascends the rivers and canals. Not found in hilly regions or in the interior of the country.

Macrones oculatus, Day.

Bagrus oculatus, Cuv. & Val., *H.N. Poiss.*, xiv, p. 424.
Macrones oculatus, Day, op. cit., pp. 156-7.

Does not reach more than 4 or 5 in. in length, much esteemed as food and caught in plenty during the rainy seasons, in rivers, canals and fields, especially in the coastal regions. Colour silvery with a dark spot at the base of the commencement of the dorsal fin.

Macrones vittatus, Day.

Silurus vittatus, Bloch, *Icht.*, t. 371, fig. 2.
Macrones vittatus, Day, op. cit., p. 157.

Found abundantly from November to January in all rivers and canals which have a sandy bottom. When caught it makes a characteristic sound by erecting its dorsal spine. Body silvery with four longitudinal bands, the lowermost of which is somewhat faint. The average length is not more than five inches; much relished as an article of food.

Macrones montanus, Day.

Bagrus montanus, Jerdon, *Mad. Jour. L. Sc.*, xv (1849), p. 337.
Macrones montanus, Day, op. cit., p. 159.

Recorded by Shankeranarayana Pillay. I was not able to get a specimen. I include it here to make the list as complete as possible.

Macrones malabaricus, Day.

Bagrus malabaricus, Jerdon, op. cit., p. 338.
Macrones malabaricus, Day, op. cit., p. 160.

Abundant in the Kallada river, and, during certain seasons, brought in large numbers along with *M. vittatus* and *M. oculatus* to the fish markets of Quilon. The presence of a black spot on the shoulder, another at the base of the caudal and a dark band along the lateral line enables this species to be easily distinguished.

Family: CYPRINIDÆ.

Nemachilus botius, Day.

Cobitis botia, Ham. Buch., *Fish. Ganges*, pp. 350, 394.
Nemachilus botius, Day, op. cit., p. 227.

Day observes that the distribution of this species does not extend south

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of the river Kistna, but Shankeranarayana Pillay recorded its occurrence in Travancore. It is usually found in the hilly regions.

Nemachilus triangularis, Day.

Nemachilus triangularis, Day, op. cit., p. 234.

Restricted to the hill streams. Specimens were obtained from Mundakayam, Devikulam, Pirmed and Thenmalai.

Homaloptera maculata, Day.

Balitora maculata, Gray & Hardw., *Ill. Ind. Zool.*, i, pl. 88, fig. 2.

Homaloptera maculata, Day, op. cit., p. 243.

Recorded from the hilly regions in the neighbourhood of Punalcor and Thenmalai. Colour dull olive becoming lighter ventrally and with brown blotches on the body. A rather rare species of no marketable value.

Discognathus lamta, Day.

Cyprinus lamata, Ham. Buch., *Fish. Ganges,* pp. 343, 393.

Discognathus lamta, Day, op. cit., p. 246, fig. 87.

Recorded by Shankeranarayana Pillay from Trivandrum. Size small, not exceeding 7 or 8 in. in length. Eaten only by the poorer classes.

Discognathus jerdoni, Day.

Discognathus jerdoni, Day, op. cit., p. 247.

Found only in the hilly regions, usually prefers streams with rocky beds. Vernacular name *kal-nakki,* descriptive of its habit of remaining attached to rocks against strong currents.

Labeo dussumieri, Day.

Rohita dussumieri, Cuv. & Val., *H.N. Poiss.*, xvi, p. 258.

Labeo dussumieri, Day, op. cit., p. 262.

Common in all the deeper rivers of Travancore. Specimens up to 18 in. in length are often seen in the fish-markets of Alleppy, Changanacherry and Quilon. As this fish grows rapidly to a moderately good size and as it could be used for stocking purposes, it is of some importance to local fisheries.

Amblypharyngodon mola, Day.

Cyprinus mola, Ham. Buch., *Fish. Ganges,* pp. 334, 392.

Amblypharyngodon mola, Day, op. cit., p. 291, fig. 92.

First recorded from Travancore by Shankeranarayana Pillay, who thereby negatives the observation of Day that it is not found on the Malabar Coast.

Amblypharyngodon microlepis, Day.

Amblypharyngodon microlepis, Day, op. cit., p. 291.

From Day's account it would appear that this species is not found in the west coast of India. Though not abundant, I have obtained stray specimens in collections of small fish from Kuttanad and in the region round about Changanacherry. Shankeranarayana Pillay also recorded this species from Alleppy, a town which is only twenty-four miles from Changanacherry.

Amblypharyngodon melettina, Day.

Leuciscus melittina, Cuv & Val., *H.N. Poiss.*, xvii, p. 304.

Amblypharyngodon melettina, Day, op. cit., p. 292.

Found all over South India. In Travancore it occurs in all the rivers and canals of the coastal region. It is very abundant in the Sasthankotta lake.

Genus: **Barbus,** Cuv. & Val.

The genus *Barbus* is fairly well represented in Travancore. Nineteen species have been so far recorded and they are found all over the country, both in the hilly regions and in the plains, though in the latter they are more abundant. Most of the species are small, not exceeding 6 to 8 in. in length, but some like *B. sarana, B. tor* and *B. curmuca* reach a maximum

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length of one to over three feet. Their migratory habits enable them to be caught in plenty during the monsoon seasons. They are not generally so tasty as certain other freshwater fish e.g. *Etroplus suratensis* and for this reason their market value is comparatively low. However, in the country-sides they constitute an abundant source of fish supply during the monsoon seasons.

Barbus sarana, Day.

Cyprinus sarana, Ham. Buch., *Fish. Ganges*, pp. 307 and 388.
Barbus sarana, Day, op. cit., p. 300.

One of the larger types of *Barbus* found in Travancore. It enjoys a wide distribution throughout the State. In the hilly regions, where it reaches its maximum length, it is usually caught by poisoning the streams. Abundant in the rivers, canals and fields of the coastal plains.

Barbus pinnauratus, Day.

Puntius pinnauratus, Day, *Fish. Malabar*, p. 209, pl. xv, fig. 2.
Barbus pinnauratus, Day, op. cit., p. 301.

Found all along the base of the Travancore hills. During the monsoon they descend to the plains for breeding. The maximum length of the specimens which I obtained from this locality was only 6 in.

Barbus tor, Day.

Cyprinus tor, Ham. Buch., *Fish. Ganges*, p. 305.
Barbus tor, Day, op. cit., p. 307, fig. 104.

Not very common in Travancore. Occasionally found in the deeper parts of the Pamba and the Manimala rivers. Since this is a large and costly fish it is not disposed off in the market immediately, unless there is a good demand. If there is no demand the fish is kept alive and captive in a unique way. A strong string is looped through the mouth and opercle and the other end of it is tied to a tree on the bank of the river. The string is long enough to give the fish some freedom to swim about within the limited range of its length. When a prospective buyer comes it is hauled ashore and sold. At one place I saw five big specimens being kept alive in this manner.

Barbus curmuca, Day.

Cyprinus curmuca, Buchanan's *Journey in Mysore*, iii, p. 344.
Barbus curmuca, Day, op. cit., p. 310.

Very rare in Travancore. Usually caught from deep cool and shady parts of rivers in the hilly regions. It is supposed to be a very good fish, and the fortunate fisherman who catches one gets whatever price he demands. The specimen which I examined was about 2 ft. in length.

Barbus lithopidos, Day.

Barbus lithopidos, Day, *Faun. Brit. Ind. Fish*, i, p. 310.

Recorded by Shankeranarayana Pillay from Trivandrum and I saw one specimen in the local museum. I did not, however, succeed in getting one myself from any part of the country.

Barbus melanampyx, Day.

Barbus melanampyx, Day, op. cit., p. 316.

A very small species not exceeding 3 in. in length found in the hilly regions.

Barbus parrah, Day.

Puntius parrah, Day, *Proc. Zool. Soc. London* (1865), p. 301.
Barbus parrah, Day, op. cit., p. 317.

Black and green above, silvery below with a dark bluish line along the sides. Not very much esteemed as food.

Barbus burmanicus, Day.

Barbus burmanicus, Day, op. cit., p. 318.

Recorded by Shankeranarayana Pillay from Trivandrum and included here only to make this list as complete as possible.

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Barbus denisonii, Day.

Labeo denisonii, Day, *Proc. Zool. Soc. London* (1865), p. 299.

Barbus denisoni, Day, op. cit., p. 320.

First recorded by Day from Mundakayam (Travancore). I was able to obtain specimens about 2½-3 in. in length from Munnar, Devikulam and Kangirapally.

Barbus melanostigma Day.

Barbus melanostigma, Day, op. cit., p. 320.

A small fish not exceeding 3 in. in length. Colour silvery with a light band along the sides and a black blotch on each side of the tail region.

Barbus amphibius, Day.

Capoeta amphibia, Cuv. & Val., *H.N. Poiss.*, xvi, p. 282.

Barbus amphibius, Day, op. cit., p. 322.

Commonly found in the coastal plains in rivers, canals and fields during all seasons. It is small and is caught along with other species of *Barbus.* Steel blue above with a black blotch on each side of the tail.

Barbus arulius, Day.

Systomus arulius, Jerdon, *Mad. Jour. L. Sc.,* xv (1849), p. 317.

Barbus arulius, Day, op. cit., p. 322.

A very small species, not exceeding 2 or 3 in. in length, recorded from the vicinity of Trivandrum and Nagerkoil. As a food its value is practically negligible.

Barbus mahecola, Day.

Leuciscus mahecola, Cuv. & Val., *H.N. Poiss.*, xvii, p. 305.

Barbus mahecola, Day, op. cit., p. 323, fig. 105.

Commonly found along the base of the Travancore hills, but during the monsoon it descends to the plains and is caught in plenty from rivers, canals and fields along with other species of *Barbus,* especially *B. pinnauratus.*

Barbus conchonius, Day.

Cyprinus conchonius, Ham. Buch., *Fish. Ganges,* pp. 317, 389.

Barbus conchonius, Day, op. cit., p. 325.

Recorded by Shankeranarayana Pillay from Trivandrum. Length not exceeding 5 in. As it is never found in large numbers it has no remarkable value.

Barbus punctatus, Day.

Puntius punctatus, Day, *Proc. Zool. Soc. London* (1865), p. 302.

Barbus punctatus, Day, op. cit., p. 326.

Does not seem to exceed 3 in. length. Olive-green above becoming white on the abdomen. The dorsal fin, which is tipped with orange, bears two rows of black spots. In some specimens these rows of black spots are altogether absent.

Barbus stigma, Day.

Leuciscus stigma, Cuv. & Val., *H.N. Poiss.*, xvii, p. 93.

Barbus stigma, Day, op. cit., p. 329.

Usually found in Kuttanad and its environs. It has a bitter taste when cooked and so fishermen, who can identify it by sight, always reject it if caught in the nets.

Barbus vittatus, Day.

Puntius vittatus, Day, *Proc. Zool. Soc. London* (1865), p. 303.

Barbus vittatus, Day, op. cit., p. 333.

A very small fish not exceeding 1½ in. in length. It is not used for cooking, as it is believed to have a bitter taste when cooked.

Barbus filamentosus, Day.

Leucius filamentosus, Cuv. & Val., *H.N. Poiss.*, xvii, p. 96.

Barbus filamentosus, Day, op. cit., p. 333.

These fish are natural inhabitants of the hilly regions, but during the rains they descend to the plains and deposit their spawn in shallow fields among

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submerged stumps of straw. During migration they are caught in large numbers.

Rasbora daniconius and **R. nilgiriensis**

Recorded by Shankeranarayana Pillay, but I did not succeed in getting either of them in the regions from where I obtained the greater part of my collection.

Rohtee bakeri, Day.

Rohtee bakeri, Day, *Proc. Zool. Soc. London* (1873), p. 240.
Rohtee bakeri, Day, op. cit., p. 340.

A small fish reaching a maximum length of 5 in. Usually found in the Manimala river and its branches and was first recorded by Day from Kottayam. The vernacular name is *mullan-paral;* and *paral* is the name by which many of the smaller species of *Barbus* are known. The prefix *mullan* means that this species contains numerous spines. So it would appear that in the vernacular nomenclature the distinction between the genera *Barbus* and *Rohtee* is not noticed.

Danio malabaricus, Day.

Perilampus malabaricus, Jerdon, *Mad. Jour. L. Sc.,* xv (1849), p. 325.
Danio malabaricus, Day, op. cit., p. 355.

Recorded by Shankeranarayana Pillay from Trivandrum.

Perilampus laubuca, Day.

Cyprinus laubuca, Ham. Buch., *Fish. Ganges,* pp. 260, 384.
Perilampus laubuca, Day, op. cit., p. 360, fig. 112.

A small species not exceeding 3½ in. in length, of no economic importance. Stray specimens when caught along with other small fishes are sold with the catch. I have not found it abundant in any part of the country. Only solitary specimens are occasionally found even in big catches.

Chela boopis, Day.

Chela boopis, Day, *Proc. Zool. Soc. London* (1873), p. 708.
Chela boopis, Day, op. cit., p. 366.

A rather small species which seems to be restricted to the southern part of the State.

Megalops cyprinoides, Day.

Megalops cyprinoides, Day, op. cit., p. 402, fig. 116.

Among the *Clupeidae* there are some species which migrate into rivers during breeding seasons, but in Travancore though there are many species of *Clupea,* which frequent its shores, I have not found any migratory forms in fresh-water. The only outstanding exception is *Megalops cyprinoides.* This fish reaches a maximum length of about 14 in. and is found in most of the rivers and canals, near the coast, during certain seasons.

Family: CYPRINODONTIDÆ.

Haplochilus rubrostigma, Day.

Aplocheilus rubrostigma, Jerdon, *Mad. Jour. L. Sc.,* xv (1849).
Haplochilus rubrostigma, Day, op. cit., p. 416.

A small fish, not exceeding 3 in. in length, commonly found in tanks, canals and fields, especially those which contain plenty of water-weeds. It is not an edible species. A closely related species *H. lineatus* has been recorded by Shankeranarayana Pillay from Sasthankotta lake.

Family: SCOMBRESOCIDÆ.

Belone cancila, Day.

Belone cancila, Cuv. & Val., *H.N. Poiss.,* xviii, p. 455.
Belone cancila, Day, op. cit., p. 420, fig. 136.

One of the commonest fish in Kuttanad from May to August. Prefers shallow canals and fields and goes about in shoals. Never found in the hilly regions except during the monsoon season.

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Hemiramphus xanthopterus, Cuv. & Val.

Hemiramphus xanthopterus, Cuv. & Val., *H.N. Poiss.*, xix, p. 47.

Hemiramphus xanthopterus, Day, op. cit., p. 425.

Found abundantly in the region between Thottapally lock and the Vembanad lake, in the low-lying fields and shallow canals. Confined to the narrow belt of coastal plain, its distribution does not seem to extend beyond 25 miles from the coast. Specimens have also been recorded from Trivandrum and from the canals of South Travancore.

Order: *ACANTHOPTERYGII.*

Family: PERCIDÆ.

Ambassis dayi, Bleeker.

Ambassis dayi, Day, op. cit., p. 487.

Very common in Kuttanad during all seasons, also found in the hilly regions of North and Central Travancore. Not recorded from South Travancore and even stray specimens have not been observed south of the Varkala tunnel. Besides this species *A. thomassi* and *A. gymnocephalus* have also been recorded from Travancore. Although the latter is found in the sea, specimens have been obtained from fresh and brackish waters as well.

Family: NANDIDÆ.

Nandus marmoratus, Cuv. & Val.

Gobius nandus, Ham. Buch., *Fish. Ganges*, pp. 96, 370.

Nandus marmoratus, Day, *Faun. Brit. Ind. Fish*, ii, p. 82, fig. 39.

Widely distributed throughout Travancore. Found in fresh and brackish waters and in marshy fields among water-weeds. Though it does not exceed 4½ in. in length it does considerable damage to freshwater fisheries as it preys upon young Cyprinoids.

Pristolepis malabarica, Day.

Catopra malabarica, Gunther, *Ann. Mag. Nat. Hist.*, Ser. 3, xiv (1864), p. 375.

Pristolepis malabarica, Day, *Faun. Brit. Ind. Fish*, ii, p. 84.

Usually found in the coastal plains especially in Kuttanad. Remains close to the banks hiding beneath overgrowths, hence it is difficult to catch in cast nets. Travancore specimens are of a reddish brown colour, hence the vernacular name *chempalli*. A closely allied species, *P. fasciata* has been recorded from the borders of Vembanad lake.

Family: GOBIIDÆ.

Gobius striatus, Day.

Gobius striatus, Day, *Faun. Brit. Ind. Fish.*, ii, p. 262.

The genus *Gobius* is not very much liked as an article of food. Though five species have been recorded from Travancore, only two of them are purely freshwater forms. Of the rest, two (*G. griseus* and *G. personatus*) are brackish-water forms and one (*G. tentacularis*) is purely marine. *G. striatus* is found in the mouths of rivers, which open into the brackishwater lakes. The Travancore specimens are darkish olive with a bluish tinge along the sides, brownish white beneath, with irregular vertical bands in the dorsal half of the body.

Gobius giuris, Ham. Buch.

Gobius giuris, Ham. Buch., *Fish. Ganges*, pp. 51, 366, pl. 33, fig. 15.

Gobius giuris, Day, *Faun. Brit. Ind. Fish.*, ii, p. 266.

In general appearance this fish resembles the previous species. It differs in colour and shows spots and blotches on the back and sides of the body.

Family: RHYNCHOBDELLIDÆ.

Mastacembelus armatus, Lacep.

Mastacembelus armatus, Lacep., *H.N. Poiss.*, ii, p. 286.

Mastacembelus armatus, Day, *Faun. Brit. Ind. Fish.*, ii, p. 334.

A common fish in all the rivers and canals of Travancore, confining itself to the regions beyond tidal influence. During summer when the water in the rivers and canals in Kuttanad become slightly brackish, these fish die in large numbers.

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Mastacembelus guentheri, Day.

Mastacembelus guentheri, Day, *Faun. Brit. Ind. Fish.,* ii, p. 334.

Found in marshy canals and rivers, always frequenting places which are not much disturbed by currents. It usually deposits its spawn under accumulations of decaying leaves and weeds. This fact has been used with advantage by fishermen for catching it in large numbers.

Family: OPHIOCEPHALIDÆ.

Ophiocephalus marulis, Ham. Buch.

Ophiocephalus marulis, Ham. Buch., *Fish. Ganges,* pp. 65, 367.
Ophiocephalus marulis, Day, *Faun. Brit. Ind. Fish.,* ii, p. 360.

Day describes the presence of a black ocellus on the upper part of the base of the caudal, but in the specimens which I obtained in Travancore—one of which is preserved at the Madras Government Museum—such an ocellus is not present. Found in most of the rivers of Travancore and very much esteemed as food.

Ophiocephalus leucopunctatus, Sykes.

Ophiocephalus leucopunctatus, Sykes, *Trans. Zool. Soc. London,* ii, p. 352.
Ophiocephalus leucopunctatus, Day, *Faun. Brit. Ind. Fish.,* ii, p. 361.

Regarded as one of the best edible fish of Travancore. It normally grows to a maximum length of about 3 ft. and being a very strong fish can easily tear through ordinary cast nets with the strong lashes of its tail. It is therefore usually shot down with gun or with arrows.

Ophiocephalus micropeltes, (Kuhl. & v. Hass).

Ophiocephalus micropeltes, Cuv. & Val., *H.N. Poiss.,* vii, p. 427.
Ophiocephalus micropeltes, Day, *Faun. Brit. Ind. Fish.,* ii, p. 362.

Grows to a large size. The largest specimen I saw was from Thodupuzha. It is very rare in the plains and is regarded as one of the best food fish of the country.

Ophiocephalus striatus, Bloch.

Ophiocephalus striatus, Day, *Faun. Brit. Ind. Fish.,* ii, p. 363.

Commonly found in all rivers, canals and tanks. According to Day the number of rays in the dorsal fin is usually 37-45, but in the specimens which I obtained from Travancore, the number is only 30-35.

The species of *Ophiocephalus* so far described are best suited for rearing in tanks and large wells. They thrive well in captivity and breed without difficulty. I met an enterprising landholder in Kuttanad who keeps a good stock of all these three species in a specially enclosed tank, but he does not profit by their breeding. Since large numbers are kept in the same tank the eggs and young ones are preyed upon and destroyed by other fish.

Ophiocephalus gachua Ham. Buch.

Ophiocephalus gachua, Ham. Buch., *Fish. Ganges,* pp. 68, 367.
Ophiocephalus gachua, Day, *Faun. Brit. Ind. Fish.,* ii, p. 364.

This fish is eaten only by the poorest class of people. There is a popular belief that these fish ascend the clouds when they take their store of water, and fall to earth again with the rain.

Family: LABYRINTHICI.

Anabas scandens, Day.

Perca scandens, Daldroff, *Trans. Linn. Soc.,* iii (1797), p. 62.
Anabas scandens, Day, *Faun. Brit. Ind. Fish.,* ii, p. 367, fig. 120.

Found all over Travancore. The possession of accessory respiratory organs enables it to live even in muddy water. It does not exceed 7 in. in length; it is esteemed as food by certain sections of the population.

Polycanthus cupanus, Cuv. & Val.

Polycanthus cupanus, Cuv. & Val., *H.N. Poiss.,* vii, p. 357.
Polycanthus cupanus, Day, *Faun. Brit. Ind. Fish.,* ii, p. 368, fig. 121.

A small inedible species, usually found in canals and tanks in the plains, sometimes extending into the interior through the larger rivers. In the fully-

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grown adult the body is a rifle green with a round dark spot at the base of the caudal. Day mentions a variety in which the body is reddish with two horizontal bands extending from the snout and slowly fading towards the tail. These are about half the length of the former type and are the young of the species. When reared in tanks within about two months they assume the adult colouration.

Family: CHROMIDES.

Etroplus maculatus, Day.

Etroplus maculatus, Day, *Faun. Brit. Ind. Fish.,* ii, p. 429, fig. 150.

Rather small in size, not exceeding 3 in. in length. Believed to be very tasty, especially when fried. *E. maculatus* is very pugnacious and both parents guard the eggs and the young during their early development. Eggs are laid in the bottom mud in places sheltered by overgrowths. The species is abundant in the lower regions of all the rivers of Travancore and in the canals, tanks and fields of Kuttanad.

Etroplus suratensis, Day.

Etroplus suratensis, Day, *Faun. Brit. Ind. Fish.,* ii, p. 430.

Considered to be the best food fish, and there is always a good demand for it all over the country. It is abundant in brackish waters especially in the Vembanad lake. These brackishwater forms are somewhat dark in colour and grow to a much larger size than the purely freshwater form. During the breeding season the colouration becomes brilliant and both parents guard the eggs and the young.

METHODS OF CAPTURE.

The different methods employed for catching freshwater fishes can be classified as (1) fixed engines, and (2) non-stationary devices. Fixed engines are those contrivances, which are fixed permanently, or for a considerable time, to one definite place. In Travancore this type includes traps of different kinds, nets fixed to the mouths of water exits, 'tripod nets' and 'trap ponds'. The second type is represented by cast nets, seine nets, angling, torch-light fishing and shooting.

Freshwater fisheries are well developed in the region round about the southern shore of the Vembanad lake. This part of the country known as Kuttanad is popularly described as fen country. It is a low-lying strip of land, over which three of the important rivers discharge their waters into the Vembanad lake, through innumerable branches, which are in turn interconnected by a close net-work of deep canals. The average elevation of land is two or three feet below the level of water in the rivers and canals, so that, except when under cultivation, the fields are covered with two or three feet of water. This stretch of watery land, intersected with deep canals and perennial rivers, possesses all the natural advantages of excellent fishing grounds to the local inhabitants, for whom fish constitutes an important article of food. Many species of freshwater fishes though usually not exceptionally large, are met with and fishing methods of different types are commonly used. These devices, so widely used in Kuttanad, are also prevalent to a limited extent in other parts of the country along the banks of rivers and water-courses.

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The commonest method of fishing is with simple cast nets, made of fine twisted cotton, with meshes varying from three-fourth to three-eighth of an inch. These nets are used in different ways. Usually they are cast from the bank or from a canoe. As a preliminary preparation the fisherman throws food in suitable places to attract the fish. Roasted rice, bran or small pieces of cocoanut oil cakes are chiefly used. After an hour or so he casts his net in these spots. From the nature of the food thrown it is evident that only certain types of fish, e.g. *Ophiocephalus*, *Etroplus*, *Barbus* and *Labeo*, and freshwater prawns can be caught by this method. Most of these species do not swim about freely through the day and so the cast nets are used either in the morning or towards dusk. It is obvious that this method of fishing, especially if the mesh is not too small, is practically innocuous, except during breeding and migratory seasons.

Under normal conditions only a very small portion of the stock in any water can be taken by means of cast nets and so other methods are usually adopted by those who make fishing a livelihood. Along the banks of most rivers and canals there are overhanging growths of semi-aquatic plants and *Pandanus*, between the interlocking stems and roots of which fishes find a safe retreat. The parts of these over-growths lying under water are surrounded by two or three cast nets held in position by two or three men. A fourth man then dives under and violently disturbs the water. By this process the fish are frightened and driven into the nets. The upper edges of the nets are then let down and the fish thus entrapped are hauled ashore or into an awaiting canoe. In the same process a single net of the seine net type, with an upper float line and a lower lead line is used. As this type of net remains in position owing to the presence of a float line, a fewer number of men can work it. This method has been practised for a very long time and, as the supply of fish decreased, it has been more and more intensively exploited, so that, in many places, overgrowths have been completely destroyed and shelter-loving fish are now consequently very scarce.

The cast net is also often used as a fixed engine. We have already stated that the fields in Kuttanad are normally covered with two or three feet of water. So one of the first steps in cultivation is to erect bunds all round the fields and with the help of oil-engines to pump the water out into adjoining rivers or canals. At the outer ends of the drainage pipes of the propellor, a large half-inch mesh net is firmly fixed. Since the entire volume of water in the field is drained through the pipe, all the fish including the very young fry are caught in the net as the water passes through it.

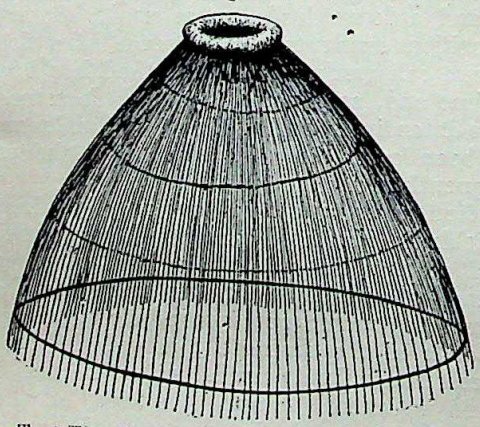
There are certain types of fish, e.g. *Etroplus suratensis*, *E. maculatus*, *Wallago attu*, *Mastacembelus* and some of the *Ophiocephalus*, which are regarded as superior food fishes. To catch such fish in large numbers certain special methods have been evolved, based on a knowledge of some peculiar habit. For catching *E. suratensis* during and after the monsoon, long narrow strips of the white tender petiolar sheaths of the plantain

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tree or the white tender leaves of the cocoanut palm are cut into pieces of uniform length and tied to a long coir rope to form a streaming festoon. Each end of this festoon is held by a man standing knee-deep in water by either bank. They wade forward along the banks, dragging the festoon with them on the surface of the water. A third man with a net, ready to be cast, follows in a canoe, a few yards behind the apex of the festoon, carefully observing the surface. Fish, probably frightened by the white line, swim towards the middle of the stream and reaching the apex dive deep, in an attempt to escape. In doing so they let out a few bubbles of air. The man with the net who watches for these bubbles immediately casts his net and it is only in rare cases that he misses his object. Though this device is usually meant for catching *Etroplus*, other fish may also be obtained.

For catching *Etroplus suratensis* a second device has been perfected, based on knowledge of its breeding habits. *E. suratensis* usually spawns in August and September. During these months, fishermen gather the petiolar ends of the cocoanut leaves and cut out the broad basal part to a length of nearly one and a half feet. These are fixed in pairs under water in the submerged paddy fields, with their basal ends upwards and in such a way that the concave inner surfaces face each other, thus enclosing a hollow space between them. The device thus set up is termed *oli* by the fishermen. The fish, which are in the habit of selecting protected spots for spawning, naturally choose these enclosed spaces in the *oli* and after depositing the eggs both the parents keep guard over them. The fisherman comes on his rounds a week after fixing the *olis* and locating them one by one, plunges a basket-like bamboo structure called an *ottal* over each *oli* in succession. The fish are thus entrapped in the *ottal* from which they are taken out by hand.



Text-Fig. 1.—Bamboo frame called *ottal* in Malayalam.

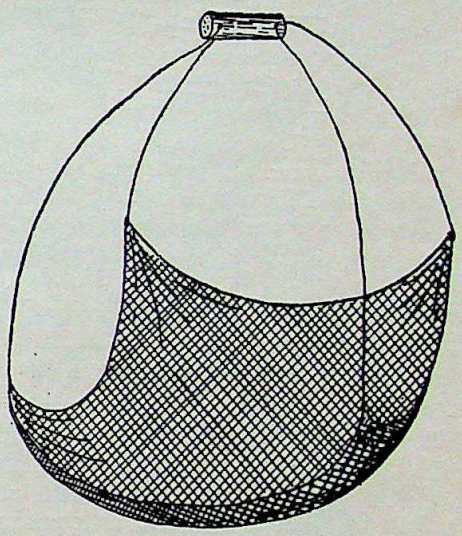
The *ottal* is made of thin rounded bamboo rods which are tied up and shaped like a large inverted basket, as shown in the accompanying diagram (text-fig. 1). At the top there is a thick ring-like aperture about six inches across, through which the entrapped fish are taken out by hand.

Etroplus maculatus, which is very palatable, is usually caught by young girls as a useful past-time. Certain small nets which may conveniently be called 'Float nets' are used for this purpose. They are made of pieces of netting about 2½ ft. square, which are cut out from old discarded cast nets. The four corners are fastened

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to four pieces of thin coir, of equal length and the free ends are tied to a piece of pith, which is large enough to keep the net suspended in water. A number of these nets are thrown into the water about 4 ft. away from the bank and about 20 ft. apart. These are properly spread out with a long pole, and a small quantity of rice bran, made into a paste, is thrown into the centre of each net. As already observed, fish of this species frequent the edges of canals, tanks and fields and are therefore easily attracted by the food in the net. Further, they have a peculiar habit of remaining for a considerable time at the spot where they have obtained food, so that when the nets are lifted up vigorously at the end of a pole, each usually contains two or three fish. This type of net is called *Uri-vala* in Malayalam and it is represented in text-fig. 2.



Text-Fig. 2.—The Float-net, *uri-vala*.

The process of catching *Mastacembelus armatus* and *M. guentheri* is also based on knowledge of their breeding habits. These fish usually prefer a muddy bottom and when entrapped in cast nets, instead of swimming towards the meshes, like other fish, they wriggle into the mud at the slightest disturbance.

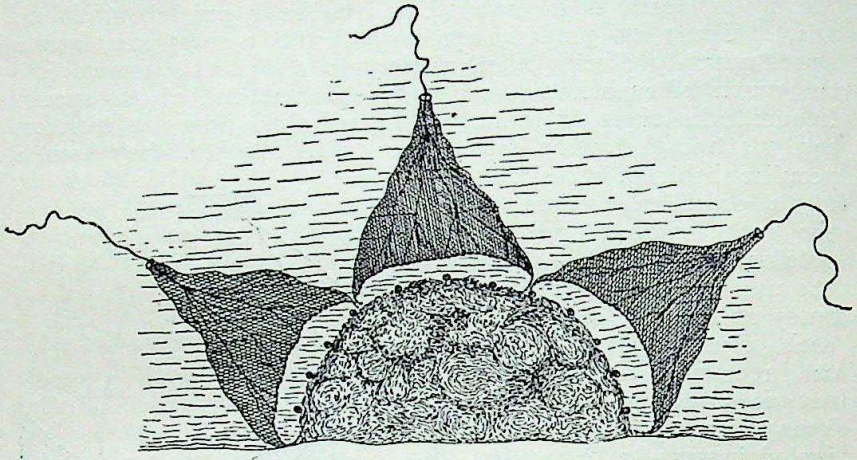
Mastacembelus spawns among accumulations of decaying vegetable matter by the banks of marshy canals or rivers, in which currents are not very strong. In such localities, fishermen select suitable spots and fix a number of vertical poles in a semi-circular row, close to the bank. The area of water thus enclosed is filled up with masses of dry cocoanut leaves, Pandanus leaves, twigs and straw. This affords a suitable place for the fish to spawn, they make their way into the heap in large numbers. Once a week the sides of the heap are covered with two or three cast nets as shown diagrammatically in text-fig. 3 and the mass of decomposing straw and leaves is lifted out in small quantities. By this operation the fish are driven into the surrounding nets. The straw and leaves are then replaced within the enclosure for repeating the process in the succeeding weeks.

From the middle of June to the middle of October one of the most important and lucrative sources of the professional fisherman's income is prawn-fishing. Though prawns are not fish, they are a sufficiently important food commodity, to be included in this account. Freshwater prawns breed from August to October. They deposit their eggs in shallow waters, and the extensive fields, covered with two to three feet of water, afford excellent breeding

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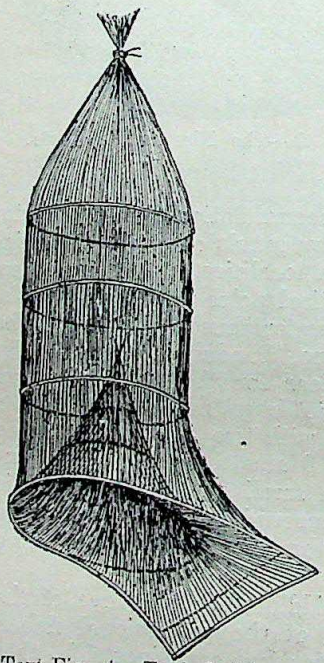
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grounds. During this season they are caught in plenty by a unique method. The visceral mass of a large snail (*Ampullaria*) is tied



Text-Fig. 3.—The setting of cast nests for catching *Mastacembelus*.

to a thin string and suspended in mid-water by a small float. A number of these bait-bearing floats are thrown over a limited area and the fisherman waits in a small canoe, with an *Ottal* (ref. text-fig. 1). When a prawn nips at a bait the float moves and the fisherman rows his canoe noiselessly towards the spot and plunges his *ottal* over the float. The prawn thus entrapped is taken out by hand. Though this process seems apparently slow and tedious, during the best part of the prawn season, a single fisherman working for about six hours catches about a hundred to hundred and fifty prawns.



Text-Fig. 4.—Typical fish trap of Travancore.

Traps of various sizes are used all over the country, and whatever be their dimension, they are all constructed on the same plan (ref. text-fig. 4). They are made of bamboo rods and each has a wide funnel-shaped mouth, which opens into a wide chamber surrounding it. The distal ends of the reds forming this chamber are free and loose, but when the traps are set up these ends are brought together and tied up with a string as shown in the diagram, thus making the outer chamber a completely closed one. Fish which enter the mouth of the trap

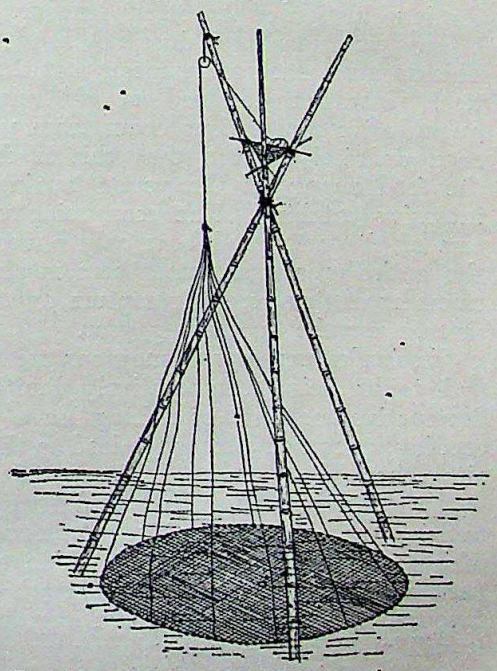
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pass through the internal opening of the funnel into the surrounding outer chamber wherefrom they cannot escape. In the plains small traps about 4½ ft. long and 3½ ft. in circumference are used by the field-labourers known as *pulias*. They are fixed in the water inlets in the bunds of paddy fields and innumerable quantities of small fry and young fish, which easily escape through the meshes of cast nets, are caught. In the hill regions, especially along the course of the Manimala river, traps 8-10 ft. long and 20-30 ft. in circumference are used during the monsoon season. Some of them are set up with their mouths pointing upstream to entrap fish descending to the plains with the flood water; while others are set up with their mouths pointing downstream to entrap those fish which ascend the rivers for breeding purposes. In some places conical nets fixed to a wide circular frame are used instead of bamboo traps.

In hilly places where the streams are long, narrow and deep, with steep sides formed of jagged rocks, cast nets cannot be used. In such places during the rainy season, when the currents are strong and dangerous, traps are set up. But during the hot weather these streams are comparatively dry and appear like a succession of pools united by more or less insignificant channels. The larger fish, which do not descend to the plains, resort to these pools. At the slightest sign of danger they take refuge under boulders and in crevices. In such places angling is widely practised. Occasionally, however, some of these pools are poisoned with a mixture of copper sulphate and the powdered seed of *Jatropha*, or of the talipot palm. Some years back dynamiting was also practised, but now, owing to the scarcity of fish this practice is dying out.

In parts of the hilly region, where the river-bed is sandy and where the water is clear and shallow, a device called *mukkali vala* (tripod net) is used. Three long bamboo poles are fixed in the river-bed and they are tied together at a point some distance below their free ends, as shown in text-fig. 5. Between the diverging ends of the poles, above the knot, a small platform is constructed and a pulley is fastened to the distal end of one of the poles. A wide circular net with a number of long strips tied to its edge, is then spread on the river-bed, between



Text-Fig. 5.—The tripod net, *mukkalivala*.

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the poles. These strings are taken up and knotted together and tied to the lower end of a rope passing over the pulley. The other end of this rope is held by a man sitting on the platform. After the device has been thus set up food is thrown into the net and this attracts fish in large numbers. The man on the platform keeps a close watch and when sure that a good catch has collected in the net, he gives a vigorous pull to the rope, which lifts the edges of the net above water-level.

In some of the larger and deeper rivers, such as the Pamba and the Manimala, *Wallago attu* is very abundant. These are usually caught by line and hook. Hooks with line about 1½ ft. long are tied to a long rope at intervals of 2 ft. thus making a long festoon of short-lined hooks. This device called *airam choonda* is tied across the river at night-fall and each hook is baited with small living frogs. The fisherman waits in a canoe near the bank and whenever he hears loud splashes in the water he knows that a bait has been taken.

Factors Injurious to the Development of Freshwater Fisheries.

Freshwater fisheries differ from marine fisheries in one important respect. In the sea, the methods of fishing or the exploitation of the fisheries, however intensive, have little or no influence on supply of fish. For instance the Herring fisheries of the North Sea and the English Channel have been intensively exploited since the introduction of the steam trawler. Still the supply of herrings in any particular year does not show any appreciable diminution. This does not necessarily mean that the supply is constant. Statistical records maintained at the places of landing show that quantitative fluctuations occur from year to year, but it has now been definitely proved that this is due entirely to variations in the food supply of the young herring and are not the result of intensive catching. The seas being wide expanses of water, the size of the nets used bear only a very insignificant proportion to the entire area and hence there is always the possibility of large numbers of fish escaping capture and thus maintaining a breeding reserve for the succeeding year.

In freshwater areas conditions are different. The rivers, canals and tanks being comparatively limited in extent, intensive and destructive methods of fishing leave indelible marks on the succeeding years and perchance lead to the despoilation of the fisheries altogether.

In general, it may be stated that under normal conditions fish multiply rapidly, producing enormous numbers of eggs and young which are distributed over a wide area by migratory habits or periodic floods. If the area over which the young scatter, affords favourable environmental conditions, plenty of food and protection, it will yield in the succeeding year an abundant catch. If, however, the fish are caught in plenty during their breeding season and if the fry are destroyed in enormous numbers it will naturally follow that the succeeding years will experience a progressive diminution in the supply of fish.

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The intensity of fishing in any particular locality increases directly in proportion to the increase in the numerical strength of the population of the locality and increase in the price of the commodity. Thus the whole problem of fisheries and fishing comes under the simple economic rule of Supply and Demand. As the demand for fish increases it gives greater impetus to the exertions of the fisherman to capture more fish. New methods of capture are devised, fixed traps are set up, the sizes of mesh are decreased and every type of fish caught, without consideration of size or food value. This propensity of the fisherman is the direct consequence of his complete ignorance of the biological aspect of the problem. He does not stop to consider whence the next year's supply is to come, when he destroys spawn fry and also the natural environment and the shelter of the fish. He does not realize that in the long run he will be depopulating the fisheries and ruining his own source of income.

The unpleasant consequences of this wasteful destruction are well exemplified in the condition of the freshwater fisheries in Kuttanad. The growth of the population of Kuttanad during the last fifty years has been very rapid. The direct result has been that the swamps and marshes which covered the greater part of the area have been drained, low-lying stretches of paddy fields have been reclaimed into extensive cocoanut gardens suitable for habitation, while improved methods of field drainage quickened up the process of cultivation. Thus a large freshwater area, which afforded the most suitable habitat for fish, gradually diminished in extent and the value of the existing fisheries began to show signs of deterioration. On the other hand, the increase in population stimulated a greater demand for fish and the fishermen to meet this enhanced demand exploited the resources so thoroughly, that year by year the supply of fish diminished and now, one can almost say, that this area, once so rich in its fisheries, is more or less denuded of fish. The price of fish which always bears an inverse proportion to the supply, also increased by rapid bounds so that fish has now become a luxury, which can only be enjoyed by those who can afford it. These facts amply support the observation of Dr. Day that 'the intensity of fishing depends on the numerical strength and nature of the population and that the country or district which is most populated will be the most denuded of fish'.

It is difficult to collect any accurate figures regarding the freshwater fisheries as they are entirely in the hands of private owners, and unrestricted fishing is carried on all the year round. No satisfactory or accurate data can be collected about river, lake and tank fisheries. However, some idea of the conditions prevailing in the entire area can be gathered from the quantity of fish caught annually from paddy fields, during the preliminary drainage operations, before cultivation. In this process oil-engines are often used, especially where the fields are extensive. When the water is thus driven out, nets are fixed to the outer ends of the drain pipes and by this means all the fish including small fry are caught. When the fields are more or less completely drained, the larger fish

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which still remain in shallow puddles and pits, are caught by hand or in baskets. As large quantities of fish are obtained in this way, the cultivator gives out the right of fishing on a system of contract. The daily catch is measured out in baskets of a standard size holding about 60 lbs. of fish and the price is fixed on the total catch till the particular field is completely drained.

Some of the bigger cultivators have maintained regular and authentic accounts of their total income including the income from fisheries. Fortunately some of them have made entries of the quantity of fish obtained from year to year and their corresponding prices. From such systematically maintained account-books of a few cultivators I was able to gather sufficient information of the condition of field fisheries. I had the opportunity of examining the account-books of twenty-one cultivators, but in many cases the information was not complete owing either to the neglect of entering the income from fisheries during certain years or not mentioning the quantity of fish obtained. However, all of them point to the same general conclusion and so I have only selected three typical examples from places far removed from one another.

Statistics of Field Fisheries of Kuttanad.

Example No. I.

Year.	Area of field.	Quantity of fish obtained.	Total price.			Price per 100 lb.			Value of fisheries per unit area of 100 acres.		
			RS.	A.	P.	RS.	A.	P.	RS.	A.	P.
1923	640 acres.	5,100 lbs.	90	0	0	1	12	3	14	1	0
1924	480 ,,	4,200 ,,	75	0	0	1	12	7	15	10	0
1925	640 ,,	4,800 ,,	98	0	0	2	0	4	15	4	0
1926	640 ,,	4,200 ,,	85	0	0	2	0	4	13	4	6
1927	640 ,,	4,200 ,,	97	0	0	2	4	11	15	2	6
1928	640 ,,	3,600 ,,	112	0	0	3	1	9	17	8	0
1929	480 ,,	2,400 ,,	68	0	0	2	13	4	14	2	5
1930	640 ,,	3,000 ,,	110	0	0	3	10	8	17	3	0
1931	640 ,,	2,400 ,,	98	0	0	4	1	4	15	5	0
1932	640 ,,	1,500 ,,	63	0	0	4	3	2	9	13	6
1933	480 ,,	1,200 ,,	55	0	0	4	9	4	11	7	11

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Example No. II.

Year	Area of field	Quantity of fish obtained	Total price			Price per 100 lbs.			Value of fisheries per unit area of 100 acres.		
			Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.
1925	40 acres	720 lbs.	15	0	0	2	1	4	37	8	0
1926	40 ,,	660 ,,	12	0	0	1	13	1	30	0	0
1927	40 ,,	600 ,,	14	0	0	2	5	4	35	0	0
1928	40 ,,	480 ,,	15	0	0	3	2	0	37	8	0
1929	40 ,,	480 ,,	3	0	0	2	12	3	32	8	0
1930	40 ,,	240 ,,	9	0	0	3	1	0	22	8	0
1931	40 ,,	240 ,,	10	0	0	4	2	8	25	0	0
1932	40 ,,	240 ,,	10	0	0	4	2	8	25	0	0
1933	40 ,,	240 ,,	11	0	0	4	9	4	27	8	0

Example No. III.

Year	Area of field	Quantity of fish obtained	Total price			Price per 100 lbs.			Value of fisheries per unit area of 100 acres.		
			Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.
1928	200 acres	1,800 lbs.	55	0	0	3	0	11	19	0	0
1929	200 ,,	1,440 ,,	40	0	0	2	12	5	20	0	0
1930	200 ,,	1,200 ,,	42	0	0	3	8	0	21	0	0
1931	200 ,,	900 ,,	40	0	0	4	7	1	20	0	0
1932	200 ,,	720 ,,	32	0	0	4	7	1	16	0	0
1933	200 ,,	600 ,,	27	0	0	4	8	0	13	8	0

These tables reveal a number of interesting facts with regard to the condition of freshwater fisheries in general. The quantity of fish in the open fields will always be proportional to the total quantity found in the entire freshwater area of the locality. If fish are abundant in the rivers and canals a larger number will find their way into the fields. If, however, there is a scarcity of fish in the rivers there will be a corresponding scarcity in the fields also. From this it is correct to infer that the condition of field fisheries gives a more or less accurate idea of the state of fisheries in general for the particular locality under consideration. The statistics indicate that field fisheries have dwindled steadily since the introduction of engine drainage. In 1923 an area of 640 acres yielded 5,100 lbs. of fish, while from the same field only 1,500 lbs. of fish was obtained in 1932. Similarly an area of 40 acres yielded 720 lbs. of fish in 1925 and only 240 lbs. in 1933. The third table supports the same conclusion that is that the field fisheries of Kuttanad have dwindled to one-third of their original yield within a period of nearly ten years. The most important

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result of the reduction in supply was a slow and steady rise in price. In 1923, 100 lbs. of fish cost the wholesale dealer Rs. 1-12-3 while for the same quantity he had to pay about Rs. 4-9-0 in 1933. During a period of ten years the price of fish has more than doubled. The increase in price has been mainly determined not only by the diminishing supply but to a greater extent by the increased demand for the commodity. This slow and steady increase in price was at first advantageous to the owner of the fisheries, since he derived a slightly higher income per unit area. The annual income per unit area of 100 acres was Rs. 14-1-0 in 1923. It rose to Rs. 17-8-0 in 1928 and 1930, but from that time onwards the fall has been rapid and reached the low level of Rs. 9-13-6 in 1932.

The annual income from the field specified in the second table bears no relation to the annual income from the other two fields. In fact the annual income per unit area of the different fields shows considerable variation, depending chiefly on their situation in relation to rivers and other environmental advantages favourable to fisheries. However, from these statistical considerations it is evident that the fisheries have suffered to a grave extent owing to the intensive and injurious methods of fishing, which were stimulated by an increased demand and diminishing supply of fish.

We shall now consider some of the immediate causes which lead to the deterioration of the fisheries in general.

All methods of fishing operations carried on during the spawning season of fishes and all methods of capture which destroy the fry are detrimental to the future of the fisheries. In Travancore, as elsewhere in the greater part of British India freshwater fisheries are not protected by Legislative measures, hence indiscriminate fishing is carried on all the year round and this is mainly responsible for the steady diminution of the fisheries.

During the monsoon, when fields and channels are flooded many fishes pass upstream and others, normally inhabitants of hill-streams, descend to the plains for breeding. During this time they lose much of their natural timidity and seem only anxious to reach places suitable for depositing their spawn. The fry of many migratory fishes of the plains pass the first year in the hill-streams and descend to the plains only with the commencement of the succeeding year's monsoon. The appearance of these young migrant fishes and the spawn-bearing adults, when the monsoon bursts with its full force, is called in Malayalam *ootha elakkam*. In large shoals they find their way into the fields or rush up against the currents. This is the time when fish are caught in plenty. All conceivable methods are employed to catch them: fixed engines of every type are set up against the currents and cast nets are used in all possible ways. This means that out of millions of spawn-bearing adults and young which start on their hazardous journey only a few manage to reach their destination. They are netted by hundreds in rivers and canals, those that manage to escape, following the flow of water arrive at the partition bunds of paddy fields and here they are again netted or trapped. If any

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manage to escape to the smaller water courses their dangers only seem to increase.

We have described elsewhere the basket-work traps used in Travancore. They are constructed to prevent escape of even very small fish. Such traps and small-meshed nets, used during the migratory seasons of fishes are largely responsible for the destruction of large numbers of fry and young fish. If allowed to reach their destination they would in due time develop into large fish. Though some types of fry do not develop into edible forms, they are still of great importance, since they form the food of the larger and carnivorous species. Hence, whatever be the nature of the fry, their preservation, directly or indirectly tends to improve the condition of fisheries, but, owing to the lack of proper control, they are destroyed in enormous numbers year after year. The gravity of this wasteful destruction of fry can be easily comprehended from the simple mathematical calculation worked out by Dr. Day, which I have adapted in a slightly modified form to suit local conditions. Let us suppose that 670 tons of fry are annually destroyed and suppose we calculate the weight of each fry at one grain we find that the number of fry destroyed is about 8,650,000,000. Suppose half the number are destroyed by natural processes and the remaining fry develop into adults weighing one pound each, at the end of one year we would get 4,325,000,000 lbs. or roughly about two million tons of wholesome fish sufficient to feed a population of three million fish-eaters of mixed diet for more than three years. Though this calculation may not represent actual figures, still it is evident that the country is suffering a considerable loss. Apart from this wholesale destruction of fry during the monsoon, there are some methods of fishing which are equally injurious to the fisheries. In Kuttanad the practice of fixing small-meshed nets to the outer ends of drainage pipes, when water from the fields is pumped out prior to cultivation, is responsible for the destruction of large quantities of young fish and fry. The mesh of the nets used is so small that not even very small fish can escape.

Many countries interested in developing and maintaining the value of their fisheries have passed Legislative measures to prevent the capture of fish during the spawning and migrating season. In Travancore there are no such precautionary measures, and hence spawn-bearing fish are destroyed in plenty without restraint. Migration is one of the essential factors in the life-history of many freshwater fishes and as a general rule migratory types produce more eggs than non-migratory forms, as an offset against the dangers which beset them in the course of their development. If left unmolested and allowed to reach their spawning grounds and deposit their eggs, the young fish which may develop from them would yield a catch in the succeeding year, which will more than repay the previous year's loss.

Among the non-migratory forms *Ophiocephalus* and *Etroplus* are regarded as very good food. Both these fishes, being of shy and retiring habits, are not often obtained in ordinary cast nets. Hence fishermen with knowledge of their breeding habits easily

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catch them, as we have already described. It is evident that their methods of catching are ruinous to the fisheries. Either the fish are deprived of the chance to deposit their eggs, or the eggs are destroyed in the process of catching the parents. *Ophiocephalus striatus* which is commonly found in the plains, builds nests and both parents keep guard till the fry hatch out. When the fry begin to swim about they do so under the protection of the parents. The parents with their brood always keep close to the banks for protection, but this habit enables them to be easily detected and caught. When the parents are caught the fry scatter and are eaten up by other fish. Similarly the catching of prawns during the breeding season is responsible for the considerable reduction in supply during the last decade.

In the hillstream region trapping during the monsoon seasons and the poisoning of streams during summer are very injurious to the development of fisheries.

From this brief account the causes which are injurious to the development of freshwater fisheries in the State may be summed up as follows:—

1. The use of small-meshed nets.
2. The use of drain pipe nets called engine nets, or *madavala*.
3. The indiscriminate use of traps and other fixed engines and cast nets during breeding and migratory seasons.
4. Methods of fishing based on knowledge of the breeding habits of fish.
5. Poisoning and trapping in hillstreams.
6. Destruction of semi-aquatic plants along the banks of rivers and canals.

These methods of fishing affect the fisheries by:—(1) preventing adult fishes from depositing their eggs; (2) destroying the fry; (3) destroying the natural food, protection and environment of the fish.

How conspicuous the ill effects have been to consumers, to the fishermen and to the owners of fisheries is evident from the statistical conclusions given. The increase in price stimulated by a dwindling supply has made fish a rather costly commodity. But this increase in price has not enhanced the income of the fishermen or owners owing to the decimation of supply. If such conditions are to prevail unchecked for another decade, this country so rich in natural resources favourable to the development of freshwater fisheries, will become more or less completely denuded of fish and many varieties of edible fish once very abundant but scarce, will be on the road to extinction.

General Considerations.

According to the Census Report of 1931 the population of Travancore is 5,100,000. Nearly 82 per cent are non-vegetarians, who eat fish if they can obtain it. The remaining 18 per cent is formed of Nambudiri Brahmins, Vishnavite Tamils and some Nair families, who came under the influence of the Nambudiris during the days of the old Matriarchal system. The entire popu-

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lation of Christians, Muhammedans, Ezhavas, Channars, and the so-called depressed classes are fish-eaters. Hence there is always a good market for freshwater, marine and salted fish.

Fish constitutes a nitrogenous food comparable to meat in food value. It is much better and healthier than the flesh of half-starved country sheep or poultry. A large demand being beyond dispute we have to enquire whether the present supply is in any way adequate. Many educated men who live in coastal towns or in places within twenty miles from the coast have expressed themselves strongly against any need for developing the freshwater fisheries. It is true that along the sea coast, marine fish are landed in plenty during certain seasons, but the entire quantity must be sold in local markets or salted and dried. During certain months even salting becomes impossible and consequently large quantities have to be buried. Along the coast therefore fish is a very cheap commodity. For a very small fraction of an anna it is sometimes possible to get sufficient good fish to feed a family of ten. It is therefore quite unnecessary to contemplate any scheme to develop the freshwater fisheries on the coast, where there is always a regular supply of marine fish. The next question we have to ask is whether the abundant resources of the sea could supply the entire need of the fish-eating population of the State. It is more or less true that the quantity of marine fish landed would be sufficient to supply the greater part of the need, if the yield could be brought within easy reach of inland consumers. The greatest difficulty, which marine fisheries have to contend with is the exceedingly perishable nature of the commodity. In Western countries freezing, canning and curing and the organization of methods to ensure quick delivery to inland consumers, by the development of rapid and accurately co-ordinated means of transport have been adopted to get over this difficulty. But it must be emphasized that only fresh fish can be used as a satisfactory substitute for fresh meat. However, in India such organization of the industry does not exist and it is not possible to distribute marine fish beyond twenty miles from the coast. For this reason in the interior of the country people have to depend entirely on the freshwater fisheries for their daily supply.

Freshwater fishing is carried on all through the year in Kuttanad, but here the supply is hardly sufficient to meet even the local demand. In the hilly regions owing to the rugged nature of the river-beds and the extreme scarcity of fish, fishing is difficult and uneconomical except during the monsoon seasons. Hence the greater part of the State comprising a population, the majority of whom will eat fish if they can obtain it, is actually forced to subsist on a purely vegetarian diet, owing to the scarcity of fish.

The introduction of co-operative methods adopted to the needs of those engaged in marine fishing industry and the introduction of refrigeration in co-ordinated rail-road transport may perhaps be a remote possibility in India, but till such a time comes the easiest and the quickest way of supplying the needs of the people living in the interior, lies in the development of freshwater

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fisheries. The existing fisheries are not only plentiful but well distributed. The great system of rivers, lakes and canals with hardly any exception will hold large stocks if properly developed and controlled.

The freshwater fisheries of the State may be classified as follows:—

1. Perennial rivers of the plains;
2. Hill streams;
3. Canals;
4. Tanks and submerged paddy fields (the latter in Kuttanad only);
5. Natural lakes;
6. Artificial reservoirs.

All these without exception contain a rich variety of fishes which have already been enumerated. These fish can be classified under three headings as follows:—

1. Predaceous fish. *Wallago attu* in particular and many Siluroids in general are exceedingly predaceous and though *Wallago* is esteemed by many sections of the population, their preservation is injurious to fisheries.

2. Non-migratory forms, e.g. *Etroplus*, *Ophiocephalus*, *Mastacembelus* and *Brachirus orientalis*. All these except *Brachirus* are best suited for rearing in tanks.

3. Migratory forms. The different species of *Barbus* and *Labeo* come under this category. They will not breed under captivity, but many grow rapidly and are well fitted for stocking tanks. The fry can be captured from the rivers and transferred into suitable tanks. In Kuttanad, though stocking is practically impossible owing to the severity of the annual floods, in the higher regions this process will ensure a constant supply of fish. Dr. Day has calculated that migratory forms produce on an average about 500,000 eggs each, but owing to the destructive methods of fishing employed, a greater proportion of the fry perish before they reach maturity. However if reasonable measures are adopted to conserve them, they will multiply rapidly and provide plentiful catches in the succeeding years.

The methods of conservation followed in other countries are:—(1) Enforcing closed seasons; (2) Restricting the methods of catch; and (3) Maintaining fish sanctuaries.

Closed seasons are enforced in England during the migratory and breeding seasons of certain types of fish, to enable them to reach their spawning grounds unmolested. During these seasons it is an offence punishable with severe penalties, to set up fixed engines or even to fish with line and hook except for scientific purposes and even then only with the written sanction of the authorities. The difficulty of enforcing this law in India is obvious, but one cannot find a suitable alternative suggestion. In Travancore fishing is carried on vigorously during the breeding seasons and we have described elsewhere how the methods of fishing are responsible for the destruction of large quantities of eggs and young.

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In the absence of closed seasons the maintenance of sanctuaries will afford the necessary protection for breeding fish. The success which has been achieved by the establishment of sanctuaries in the Punjab is well known to those interested in the development of fisheries. A number of sanctuaries are maintained on the tributary streams of the Beas and they are guarded by a staff of inspectors, who enlist as far as possible the co-operation of the villagers on a system of rewards. That the protection thus afforded has met with some measure of success is seen from the fact that these sanctuaries now teem with fish and there is conclusive evidence that the stock in the main river has noticeably increased. In Travancore fish sanctuaries can be very successfully developed, but before doing so it will be necessary to study the precise migratory and breeding habits of the important freshwater edible fish of the State.

A still easier and practicable method of improving the fisheries of the State is by restrictions on the methods of fishing.

The restrictions usually suggested are:—(1) Regulating the size of mesh of cast nets; (2) Preventing the use of traps and fixed engines during migratory and breeding seasons; and (3) Preventing the poisoning of streams.

Dr. Day was the first to suggest that the size of mesh must be regulated, but this suggestion has been criticised by a few who believe that cast net fishing is 'practically innocuous' to fisheries of any locality since only a very small proportion of the fish of that locality can be caught by this method, and further that the fish are naturally protected by the big and turbid waters of the floods. Even if this observation is true of large bodies of water so far as small rivers, canals and streams are concerned, we are convinced that the use of small-meshed nets is positively harmful, particularly in Travancore, where it is a common practice to use very small-meshed nets as *fixed engines*. By this process even small fry are filtered out. The system of licensing nets has been introduced in the State; if this could be extended to encompass freshwater fisheries as well, and if the licensing fees were considerably increased in the case of small-meshed nets, it would effectively discourage the use of such nets in due time.

There has been a considerable outcry against the use of traps and fixed engines, and Dr. Day, in his work on the freshwater fish and fisheries of India, pointed out the serious consequences of this practice. The millions of small fry which are slaughtered in these traps and sieve-like fixed engines if allowed to escape and mature, in due time would grow to sizes varying from one pound to twenty pounds or more. For this reason he suggested that the method be made illegal. On the other hand the report on the freshwater fisheries of the United Provinces, maintains that traps are positively uninjurious to the fisheries of any locality as they capture only small and unimportant types which do not develop to any size. It is generally believed that experience and the accumulation of scientific data always acts as a check to the exuberance of imagination and the tendency to jump at conclusions. The observations in the United Provinces fisheries report

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are based on inadequate information and uncertain analysis of a 'number of catches'. In such matters one would hesitate to draw any general conclusions even after regular and systematic analysis of a few months' catch. Two years before the publication of this report Dr. Hora published an account of the Fish and Fisheries of Manipur and he definitely stated that by the use of traps large quantities of fish are caught. In Travancore trap-fishing is well developed and traps of different sizes are prepared to catch both small and large fish. In the large traps which are set up along the course of the river Manimala and in almost all the hill-streams, plenty of large fish are caught while the smaller traps used in the plains are mainly for small fish, including fry and the young of *Ophiocephalus*, *Barbus*, *Etroplus*, Siluroids and young prawns. These traps, whatever their size, are set up in bunds, which are specially constructed across rivers and water-courses. The flow of water is thus checked and diverted into the traps, through which it is sieved out. In this process fish have no means of escape. Only a few, such as *Labeo* and *Ophiocephalus*, are able to jump over the bunds into the streams below.

In spite of this overwhelming evidence against the practice of trap-fishing, suppose for a moment we agree with the observations of the United Provinces Fisheries Report, that only small and unimportant fish are obtained in traps—though we fail to see the reason why under such unprofitable conditions the fishermen should persist in setting up traps—still the fact remains that small and unimportant fish are the natural food of the larger and useful ones and their capture indirectly tends to ruin the value of fisheries by destroying the food of the larger types. With all these facts before us we see no reason for hesitating to agree with the conclusions of Dr. Day that trap-fishing is positively harmful to the development of fisheries and therefore forceful measures should be adopted for its discontinuance.

In this short account we have attempted to bring into prominence some of the destructive methods of fishing, which are threatening to depopulate the freshwater fisheries of the State, but we have not ventured to suggest any positive measures which will overcome these defects and restore the fisheries to their normal flourishing state, since such a task mainly rests with the Fishery administration of the Government and is beyond the scope of a paper of this type. However in a general way we can conclude that if the wasteful and destructive methods of fishing which are now widely and indiscriminately practised in the country are discouraged by the enforcement of suitable legislative measures or regulations, the freshwater fisheries of the country will once more revive and afford a new source of revenue to the State and plenty of wholesome and cheap food of high nutritive value to the people living in the interior beyond the reach of Marine fish markets.

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CUCKOO PROBLEMS.

BY

T. R. Livesey.

(With a Comment by E. C. Stuart Baker).

(*With 4 plates*).

The parasitic cuckoos set a whole series of exciting problems to the naturalist—and especially to the oologist. This note is written in the hopes that it may induce members of the Society to record their personal opinions and observations on a subject of peculiar interest.

1. What exactly is the particular significance of the hawk-like appearance of the Common Cuckoo (*Cuculus canorus*), with its pointed wings and long tail—and especially the barred lower-plumage, that recalls the lower plumage of the sparrow-hawk? Is it mimicry with advantage?

To us the cuckoo certainly resembles a hawk of the sparrow-hawk type, but that is not to say that birds see such a resemblance. Birds are especially clever in their recognition of the different species of the birds of prey—their lives depend upon it.

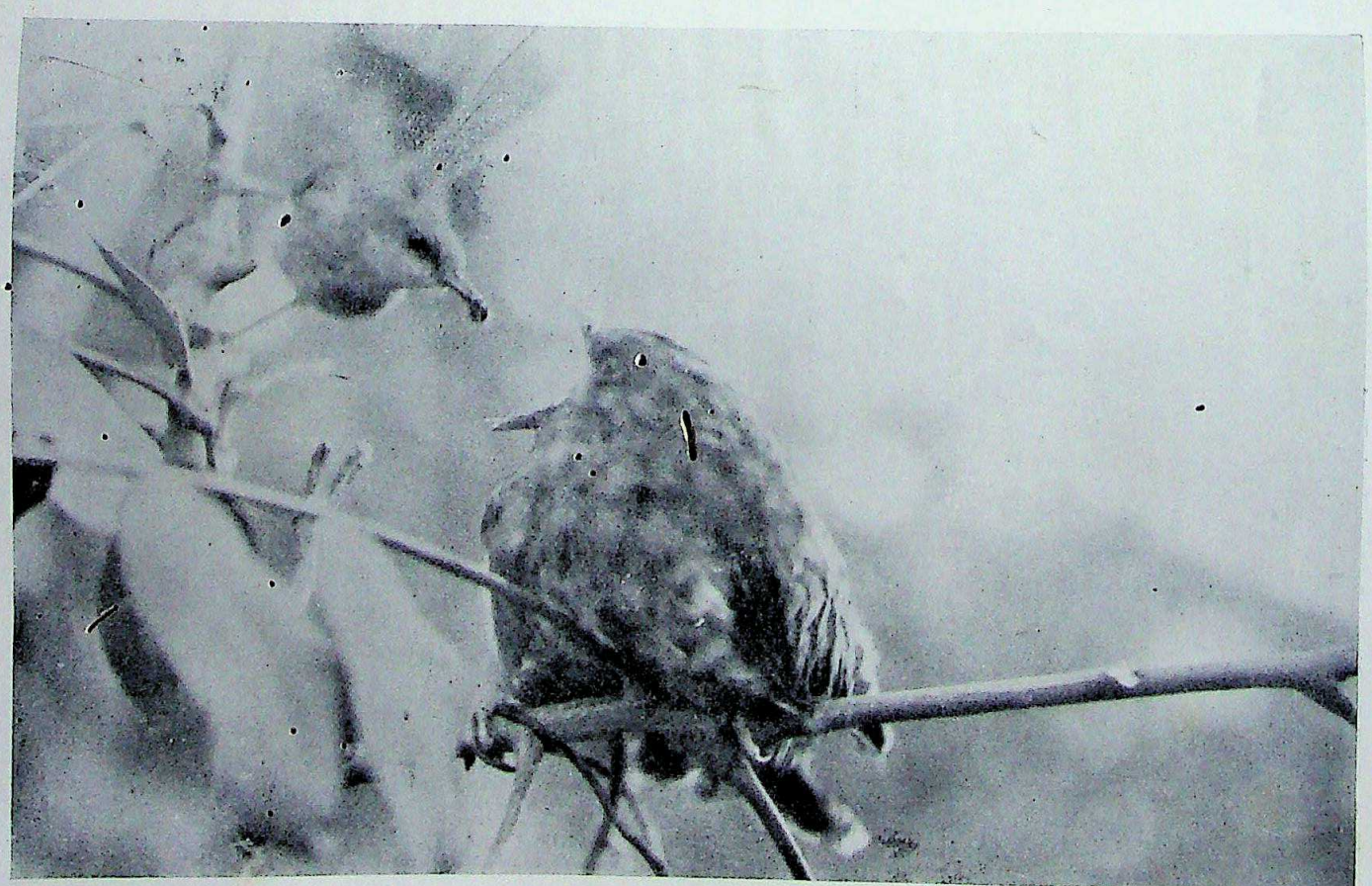
I have not noticed that birds are frightened of the cuckoo—although they show an excited interest generally in cuckoos. Nor have I seen any combination between the male and the female cuckoos at the time the hen cuckoo deposits her egg which would suggest that their hawk-like appearance is in any way brought into play to distract, or frighten, the intended fosterer. Species that habitually foster the cuckoo seem to be attracted by the cuckoo, and I have seen the Burmese Stone-Chat—*Saxicola c. burmanica*—(the commonest fosterer of the cuckoo in the Shan States) constantly seek out the cuckoo and sit close to it in apparent excitement and interest. I have seen these chats sit close to the cuckoo right out in the open at the top of a bare bamboo for a considerable time and in no way, it seemed, were they frightened by the presence of the cuckoo, preening their feathers from time to time.

Further observations of a like kind confirm my belief that birds are not frightened of the cuckoo, and therefore, I am not inclined to think that cuckoos appear to them at all hawk-like.

Then if the barring of the lower-plumage is supposed to be in mimicry of the sparrow-hawk—what does the barring on the lower-plumage of the small cuckoos, like the Bay-banded Cuckoo (*Penthoceryx*) mimic? There is no such small hawk to mimic

Light dawned upon me—so I thought, quite recently in this connection. I was sitting in a hide waiting to photograph a pipit feeding a fledgling Khasia Hills cuckoo (*C. c. bakeri*). Whenever the young cuckoo got frightened, as it did from time to time, it reared itself up and puffed up its crown feathers, and began to

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'Please' *Photo by author.*

Baby Burmese Plaintive Cuckoo being fed by its diminutive foster-mother—a Franklin's Wren-Warbler.

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turn-about like a wryneck. The resemblance to the wryneck was so striking that I at once saw—so I think—the special significance of the barred lower-plumage. The young cuckoo had become a snake! The resemblance of the barred lower-parts to the ventral scales of a snake was most striking and the resemblance to a snake was still further emphasised when the young cuckoo opened its great orange gape. The barred upper-plumage was not unsnake-like, though here that might as well—if not better—be explained as protective colouration. Now the same snake-like effect may be seen in the case of the young of the smaller cuckoos like the Plaintive Cuckoo to which such a resemblance would be of equal value in scaring off enemies, such as wandering dogs, etc. (pariah dogs here regularly hunt the fields for young birds).

If this is then the explanation of the barred plumage of the cuckoos when fledglings—why does it persist into the adult plumage? And again, why the hawk-like wings and tail?

The barred plumage would naturally tend to persist in the adult plumage, unless there were reasons why it should be eliminated. Perhaps there are no such reasons for elimination—and again, it may persist by reason of aesthetic selection—it may well be admired and desired.

The Common Cuckoo loses the barring on the upper-plumage when adult. What does that mean? I can only suggest that it is lost as it is not admired—that it is not distinctive enough—and that the plain coloured plumage is preferred. But I confess the weakness of my remark. As to the long wings and tail—perhaps the roving, promiscuous habits of the cuckoos, and their migrations, demand a little speed and stream-lining.

2. Do the fosterers seek to defeat the cuckoo in her intention to victimise them—or do they seek to attract her to deposit her egg in their nest? One thing is certain, and that is that the the fosterers are *not indifferent* to the presence of the cuckoo—especially if they have a nest in the vicinity. I have noticed that whenever a cuckoo perches on the top of a high bamboo clump near my house, as one frequently does—it is almost sure to attract the attention of the nearest pair of stone-chats. These little birds are not in the habit—especially the female bird—of sitting on such a high and exposed position—yet if the cuckoo is up there they invariably fly up to it in some excitement and interest. They seem to flirt with the cuckoo, and flutter about it—first on one side and then on the other. Meanwhile the cuckoo has got a stupid, stuck look on its face, and keeps for a long time in this dazed and mesmerized state. What does it all mean?

I have seen a cock chat sit for a long time within two feet of a cuckoo on a single and exposed telegraph wire. Certainly it was in no way afraid of the cuckoo.

Why is this interest shown in the cuckoo? If the chats wished to conceal their nest from the cuckoo they would surely lie low and not advertise their presence. Again, some cuckoos were this year constantly feeding on some bare ground by my house—flopping down every now and again from the nearby fence to pick up something that they were eating. The chats were always in atten-

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dance upon them and in an excited state. Other birds did not seem interested.

Once, when the cuckoo was on its high perch on the bamboo top with a chat alongside, the chat suddenly flew off in a dip to some dead ground some forty yards beyond the bamboo clump. It was the hen chat. When I searched the locality later on I found her nest there with hard-set eggs in it. The cuckoo did not deposit in that nest—probably because the eggs were hard-set —but it appeared to me that the chat had clearly *shown its nest* to the cuckoo. They may have actually reared one themselves in a previous year.

As human beings we are over-inclined to attribute our own human feelings to animals—we think that the fosterers would resent being imposed upon, and so we are too inclined to believe that they seek to cheat the cuckoo in her intentions.

Cuckoos seem to find very easily every nest of the species they victimise—the most cunningly-hidden nest does not escape them. It is true that they sit and watch the fosterers for long periods with the utmost patience—but do the fosterers help them in their quest? It seems to me very probable that some do. If this is true then the cuckoo does not resemble a hawk in their eyes.

3. How does the cuckoo deposit her egg in the nest of the fosterer? This is perhaps the most exciting problem the cuckoo sets us, and which every ornithologist hopes to discover.

Mr. Edgar Chance in his *Cuckoo's Secret*, published thirteen years ago, showed the systematic way of studying the habits of the cuckoo, and by his photographs proved that the Cuckoo in England when desirous of depositing her egg in the open nest of the Meadow Pipit actually sits on the nest to lay into it. He was careful not to generalise from his observations and attribute to cuckoos this habit when victimising other fosterers—other species—in other places.

He had the cuckoo filmed and photographed *actually sitting on the nest*. I have been completely out of touch with Europe and all publications so that I do not know what further discoveries have been made and proved to Science in this matter—but I believe that nothing further has been proved. The crux of the problem now is not how the cuckoo deposits her egg in an open cup-shaped nest easy of access—like that of an English meadow pipit, but how she deposits her egg in a nest in which she cannot sit by reason of its having too small an entrance to admit her body—as in the case of a wren's nest (in which cuckoo's eggs have been found), or by reason of the nest being situated in a narrow place into which she could not possibly squeeze herself to sit on the nest. How the cuckoo dealt with such a problem was one of the problems he did not solve.

Now Mr. Chance—in spite of his name—studied the cuckoo with such careful method and with such system that he could predict in which pipit's nest the cuckoo would deposit on any particular day—and approximately at what hour. This is how he managed to get his photos taken. I wrote to him many years ago suggesting that he might solve the problem of how exactly the cuckoo

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Photo by author.

Sewn into a single living leaf, a nest of Franklin's Wren-Warbler containing an egg of the Burmese Plaintive Cuckoo.

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deposits her egg in an inaccessible nest by simply placing a small basket contrivance securely over the open pipit's nest so as to convert it into a domed nest and one into which the cuckoo could not sit and lay directly. Or, he could have obtained the same result by the placing of stones round the nest. He might then have seen how the cuckoo met the problem set her—one she finds very commonly in Nature.

But as far as I know he did not do so—nor anyone after him. This problem of how the cuckoo gets her egg into *inaccessible* nests is very much in evidence in a country like Burma, where, in the Shan States the commonest fosterer of the Cuckoo is the little Burmese Stone Chat which makes a nest generally in some crevice—or under a clod of earth—where a cuckoo could never enter to sit on the nest. I judge these nests by trying to put my hand (a small hand) into them and take out a chat's egg. If I am unable to do so then I conclude that the cuckoo with her long tail is also unable to get in. I should say that about 70 per cent of these chat's nests are inaccessible, judged by this standard.

A very good example of such an inaccessible nest was one I found in a section of bamboo lying out on open ground. This photo was published in the Society's *Journal*, vol. xxxvi, No. 4 of December 15, 1933.

It may be asked why I did not myself sit up over such nests and solve the problem. I am sensible to the reproach, but there are great difficulties in the East to contend with, and it is very difficult to find all the nests of the fosterers in any given area—besides I was ill when the best opportunities offered.

A point that is worth mentioning in regard to these inaccessible chats' nests is that many of them are situated—in fact most are—under clods of earth in ploughed fields, and when the chats lay in April and May the earth is parched and dry and of a crumbly nature so that the least disturbance of the clod brings it down on to the eggs. Any attempt on the part of a cuckoo to get in under the clod would certainly, with her long tail, cause a falling of earth on the chat's eggs, and subsequent desertion.

In a nest I took this year it was quite impossible to get the cuckoo's egg out with the hand—even using two fingers for the purpose—and I had to carefully poke my handkerchief in with a stick over the eggs to protect them from being broken by the earth that would fall when the place was opened out.

The Little Plaintive Cuckoo must find the same difficulty in getting her egg into a Franklin's Wren Warbler's (*F. gracilis*) nest as *C. c. bakeri* does in getting hers into inaccessible chats' nests.

Until the exact way these cuckoos get their eggs in to such inaccessible nests is known to Science—we cannot claim to have discovered the whole of the cuckoo's secret.

There is one more point to consider. Sometimes one finds a cuckoo's egg lying just outside a chat's nest. In that case it would appear that either the chat has kicked it out of its nest—an impossibility in my opinion—or that the cuckoo placed it

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there—either by laying it there—or by putting it there in her bill. Now, in 1933, I found here three cuckoo's eggs in the same vicinity at short intervals of time which were all found lying outside the chats' nests. These three cuckoos' eggs were obviously the product of one bird—and being small eggs I suspected them to have been laid by a young bird. The chats' nests in these three instances presented no particular difficulty for the cuckoo to deposit in although all were of the inaccessible type. The eggs of this cuckoo were in all three cases lying about six inches outside the chats' nest—and were in no way damaged.

This year I found again a cuckoo's egg lying six inches outside an accessible chat's nest and I have a very attractive photograph of it.

From the above it would not appear that the chat is responsible for this *contretemps*—for the eggs were not damaged—were approximately always six inches outside the nest and in one case they were the three eggs of a certain individual cuckoo.

So therefore I conclude it was the cuckoo's doing and that she laid her eggs there.

Why was it left outside? Perhaps the hen chat sat tight and refused to get off her eggs—perhaps the cuckoo was disturbed and frightened, but from the fact that a particular cuckoo did it three or more times in one season points to an idiosyncrasy in that particular individual.

I think that it is certain that all these eggs were laid where they were found just outside the nest. Is this laying just outside the nest the preliminary action before putting the eggs in with the bill?

4. Does the male cuckoo assist the female in any way in depositing her egg?

As the cock cuckoo can be distinguished by his call note *cuck-koo* that makes observation easier than it might be. They are in the habit of perching on some high tree or bamboo clump affording a good look-out, and seem to spend most of the day thus—going from one prominent tree to another, chasing rival male or female cuckoos. Very little time seems to be spent in feeding. What is the meaning of these long waits in the tree tops? I think a good part of the time of the male bird is devoted to a close observation of the surrounding fields and open ground for fosterers' nests, and that when located, it shows them to the female cuckoo to win her favours. I saw a male (calling) cuckoo fly down to a chat's nest which was in an exceptionally deep hole in the ground—after a few seconds it flew away. There were eggs in the chat's nest—slightly incubated. What was its object in visiting this chat's nest? Not to eat the eggs. It never touched them. No cuckoo's egg was deposited in this nest subsequently —which rather spoils my story—still I think that it found this nest in order to show it to its mate. What other object could the bird have had? It was a most cunningly-hidden chat's nest. That no cuckoo's egg was deposited in it may be accounetd for by the fact that the eggs were incubated, and the nest about 15 inches down in a crack in the ground.

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What more natural than that the male cuckoo should assist its mate in the finding of fosterer's nests?

5. Why do cuckoos remove eggs from nests sometimes?

It seems to be the rule for cuckoos to remove an egg of the fosterers' when depositing their own, and Mr. Chance saw them remove the fosterer's egg first, and then sit on the nest to lay, holding the fosterer's egg in the bill meanwhile. Such removals are, we suppose, to make room for the cuckoo's egg, and that is a reasonable supposition. But there is another aspect to this removal of eggs, for cuckoos often remove a single egg from a nest and never deposit one of their own in its place. Why?—I think it is to test the state of incubation of the eggs—to see if they are fresh enough for depositing their own egg among them.

It does not appear to be for the purpose of eating the eggs —although the single egg taken is undoubtedly eaten by the cuckoo. If that was their reason they would return to such nests and eat the whole lot of eggs (these chats lay 5-6 eggs). I have never observed more than the one egg being taken. The year before last, at about dusk, I saw a cuckoo glide down to a chat's nest in a ploughed field. After a moment at the nest it flew up and towards me, passing straight across my front at 20 yards distance, clearly silhouetted against the evening sky. It had an egg in its bill. It had no egg in its bill when it flew down to the chat's nest. It flew up on to the top of a bamboo close to me. When I had got my field-glasses on to it the egg was gone. I searched under the bamboos but found no broken egg and so I concluded that the cuckoo had eaten it.

Now these chat's eggs were very hard-set. Next day they hatched. No cuckoo's egg was deposited among them.

What was the cuckoo's object in taking one egg from this nest? Not to eat it—for the cuckoo would have then eaten the lot at the visit it made to the nest—or returned later and finished them. I think it was to test the state of incubation of the chat's eggs. The cuckoo found them hard-set and unsuitable and so did not deposit its egg among them. Eating the eggs was just a convenient way of disposing of it.

Single eggs are often thus missed from a nest. Hunting for cuckoos' eggs, one marks down all the chats' nests one can find and then visits them from time to time, and so such diminution in the number of eggs in one or another nest is often noted.

A curious incident happened ten yards in front of my window this year. There was a Blyth's pipit's nest there under a clod of earth and on the morning in question there were two eggs in it on the point of hatching and one young one just hatched. Suddenly a cuckoo came swooping down to it and after a scramble at the nest flew off with one of the eggs. I went to inspect the nest and found that the young one had been kicked out of the nest to a distance of about a yard—and in the nest there remained but one egg. I put the young one back. The nest was destroyed by dogs a few days later. The cuckoo must have known in this instance that the eggs were hard-set and unsuitable—yet it took one egg. I think it was just habit. It flew down,

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I suppose, with the intention of taking an egg—and did so. Although the eating of an egg is not, I think, the cuckoo's primary object yet no doubt they enjoy it.

I am inclined to think that both male and female cuckoos take eggs in this manner to test their stage of incubation. To know their state of incubation is most essential for them. Chats' nests are so often so tucked away in holes and crevices that the eggs are in comparative darkness and their condition may not be apparent to the cuckoo by merely looking at them.

We know more or less how the cuckoo watches the fosterer's nest being built and has her egg ready to deposit in it at the right time—and in such cases I do not think any egg is removed with the object of testing its incubation. The cuckoo knows well enough that they are quite fresh. Then, if an egg is removed, it is removed at the time of depositing in the nest—to make room for the cuckoo's egg—not to test the state of incubation.

I suspect that both male and female cuckoos are given to this egg-testing. That would be a reasonable supposition if we believe that the male assists in finding the nests. The testing being of course a part of the finding of suitable nests.

So it would appear to me that there are two aspects to this egg removal—one to make room for the cuckoo's egg—and secondly to test the state of incubation of the fosterer's eggs.

6. Why is the common cuckoo's egg so small?

I think that a reduction in size has been achieved for the purpose of adaptation to the small eggs of birds chosen to be fosterers—not as Mr. Chance does, that it is because the cuckoo has to retain her egg in waiting for a suitable moment—or day even—to lay. A clue is to be found among the other species of parasitic cuckoos. The Koel for instance lays a normally-sized egg though her difficulties in depositing it in the nests of crows may be greater than that of the Common Cuckoo, as there may be opposition from the crows.

If adaptation in colour in the egg why not in size too?

7. How is the adaptation in colouration—in ground colour and markings—of the cuckoo's egg to those of its fosterer brought about?

Even people who are scarcely at all interested in birds wonder at the mimicry of the parasite's egg.

One obvious theory is that natural selection working through desertion has brought about this adaptation—that cuckoos' eggs which contrasted too violently with the fosterers' have been frequently deserted through the ages, and so unadapted eggs and their might-have-been progeny eliminated—until well adapted eggs came slowly into being—slight individual variations in cuckoos' eggs determining whether they should be retained and incubated—or deserted by the chats.

I confess I do not like this theory at all. The more we know of wild animal life the more we see *design* and the more we appear as the simpletons! It is hard to think of mimicry taking place without guiding *desire* on the part of the animal that is to benefit by that mimicry. I prefer to see more intelligence in

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Nature, and look elsewhere for a solution to this 'colourful proposition'. I know it is difficult and open to ridicule to suggest the inheritance of 'acquired characters', etc., but a biologist finds difficulty and ridicule an incentive to thought and observation. Let us consider this problem.

It is certain and to be seen that cuckoos have their eggs very well adapted to the eggs of special species of birds they victimise. Here in the Shan States, we see the *C. c. bakeri* parasitic on two species—the Burmese Stone Chat (*S. c. burmanica*) and the Dark-grey Bush Chat (*O. ferrea harringtoni*) (which lays pale blue immaculate eggs in Burma). The Stone Chat's eggs are a pale greenish-blue in ground colour handsomely and well marked with rusty red markings, which often tend to form a zone or a cap at the larger end. The Bush Chat's eggs are a delicate pale, immaculate blue. The cuckoos lay two types of eggs—one type rather like an English robin's egg—a pale yellowish-white in ground colour marked with light red which often zones the egg, to resemble the Stone Chat's eggs, and the second type is a pale blue, immaculate egg admirably adapted to the eggs of the Bush Chat. In this area there may be other types of adaptation but they are uncommon. (I suspect one type, adapted to the eggs of the Crested Bunting.) Although the red type eggs of the cuckoo parasitic on the Stone Chat are very like Stone Chat's eggs—they are larger, and never seem to show any bluish or greenish tint in their ground colour. And the pale blue immaculate eggs of the second type of cuckoo never seem to show the least signs of any markings.

I have noticed that where there are bush chats, the blue cuckoo's eggs are invariably deposited in their nests. But bush chats have become very scarce in the vicinity of Taunggyi in the South Shan States, due to the clearing away of light scrub jungle and the general flattening out of the countryside following 'civilization', so that blue-egg-laying cuckoos that still haunt the Taunggyi neighbourhood cannot find bush chats' nests in which to deposit. I myself have not seen a pair of bush chats this year here—although they were not uncommon here some ten years ago. Therefore *faute de mieux* the cuckoos are depositing their blue eggs in nests of the Stone Chat wherein they appear in violent contrast. But I have found none deserted on that account. I have found no cuckoo eggs of the red type in nests of the Bush Chat. I may say that stone chats are extremely common and bush chats generally far scarcer. There would be about 10-20 pairs of stone chats to one pair of bush chats—some proportion like that, in the Shan States; but I think the proportion of blue-egg-laying cuckoos to the red-laying type to be rather higher than might be suspected. I should say there is one blue-egg cuckoo to seven red-egg cuckoos. It is almost certain that the Bush Chat was a much commoner bird in these States many years ago—before the population of humans had so increased. They like wild, scattered scrub jungle, whereas the little Stone Chat is friendly to human beings and loves the open cultivated lands.

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As might be expected then, we find a number of these blue cuckoo's eggs deposited in stone chats' nests instead of in the fosterer's to which they are adapted (bush chats). As the Stone Chat does not appear to mind the violent contrast (these pale blue eggs have a startling white appearance in a stone chat's nest) the blue-egg cuckoo continues on without any appreciable diminution in numbers, I think. If the *desertion theory* was here in working order we should find that these violently contrasting blue eggs were being frequently deserted and that in consequence the blue-egg cuckoos were diminishing. I do not think they are diminishing. In spite of no adaptation to the fosterers they are now choosing they seem to be as successful as the red-egg type of cuckoo. I have noticed no desertions.

How did these two types of egg, each so well adapted to the eggs of a particular host, reach their perfection of mimicry? What influences the colouring of the egg shell of the cuckoo's egg? When two cuckoos mate the male cannot of course influence in the slightest the colour, or size, of the egg that the female cuckoo lays as a result of their union. The yolk, white and the shell of the egg are entirely maternal products of the female cuckoo and are not derived from the fertilized ovum. But the young cuckoo born from their mating will inherit tendencies from both its parents. We can imagine a case in which the male cuckoo was born from a blue egg in a bush chat's nest laid by a female cuckoo fertilised by a male also born from a blue egg. Should such a male mate with a red-egg female, their offspring—a daughter for instance—should inherit the blue-egg laying quality from her father and the red-egg laying quality from her mother! What eggs will she lay when she becomes mature? It should be an egg of intermediate type between the two—say a blue egg with a few sparse red spots on it. But such eggs are not found. The eggs seem always to be true to their respective types, and that is perhaps a point in favour of Mr. Chance's contention that the blue-egg type cuckoos breed only with blue-egg females, and the red-egg type with the red-egg type, and so *direct* as it were a pure parasitism against their respective fosterers the Bush Chat and the Stone Chat.

And yet there are difficulties in such a belief. In such promiscuous birds as cuckoos appear to be, it would seem certain that the different types co-habit, and again, certain that their union would be fertile. In this consideration a further point comes out. If the male cuckoo assists the female in finding nests of the fosterer, in an alliance of two types, they would be at cross purposes, the blue-egg male showing bush chats' nests to the red-egg female who would desire but stone chats' nests!

That the types keep to themselves and do not interbreed may be worth considering. Or, could we believe that in the matter of egg-shell colouring the female is completely prepotent over the male influence. And in that case, the offspring would always follow the mother's habits and, if a daughter, deposit in the nests of the same fosterer that she was reared in, irrespective of her

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Photo by author.

Blyth's Pipit feeding young Khasia Hills Cuckoo. Note double white patch on the head of the young Cuckoo.

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Photo by author.

Blyth's Pipit and young Khasia Hills Cuckoo.

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father's upbringing. One feels inclined to leave all these complications to the judgment of the High Court!

And yet, as if this was not complicated enough, we get a further refinement of the problem. The Burmese Plaintive Cuckoo in the Shan States commonly lays two types of eggs—the one white with red markings, and the other bluish with red markings. Now these two types are not parasitic on different species of fosterers as in the case of *C. c. bakeri*—but they are parasitic *on the same species*—Franklin's Wren Warbler, which lays here two types of eggs—the one white with red spots, and the other bluish with red spots. And the cuckoos are particular to get the white egg into the white-egged *Franklinia*, and the blue egg into the blue-egged *Franklinia*! How indeed can we believe here that the two types of Plaintive Cuckoo do not interbreed?

That leads me to think that perhaps the maternally inherited tendencies are completely prepotent over the males in the matter of the egg-shell colouring and in the selection of the species to serve as fosterer. But the point at issue is being lost.

Let us consider first the case in which we have a pale blue, immaculate egg of *C. c. bakeri* in a nest of the Bush Chat. Here is an instance of perfect mimicry except that the cuckoo's egg is rather larger.

If this remarkable adaptation has been brought about by natural selection working through desertion—the *desertion theory*—it supposes that the cuckoo has taken no initiative in the changing of her egg through the generations it has taken to bring about the adaptation, but that the chat has—that the chats have ever been of a particularly discriminating nature and extremely critical of the egg deposited in their nest—deserting whenever the cuckoo's egg contrasted violently with their own. This implies that the intelligence shown has been entirely on the side of the chats. Somehow I feel this to be all wrong. I am inclined to attribute the adaptation rather to the cuckoo which is the one to benefit by that mimicry, rather than to the chats.

The *desertion theory* relies upon cuckoo's eggs showing slight variations. It has been commonly held that such slight variations have no particular significance—that they are little unaccountable 'jumps of Nature'. Now that does not appeal to me at all. I think a biologist should avoid such a 'jumpy' attitude of mind. I think he should say rather that he is unable to appreciate the meaning of such slight variations. Such slight variations—barely perceptible—are not—I prefer to think—haphazard 'jumps', but definite indications of tendencies we may—or may not—be able to appreciate which have their origin in the germ plasm.

If that is so, the slight variations of colour and markings in the cuckoo's eggs are not just unmeaning 'jumps'—occurring without purpose—signifying nothing in particular—but rather they are definite differences produced by that individual cuckoo, that have a meaning even if it is not given to us to see what that meaning is. That is to say, that *it is the cuckoo that is bringing about the change in her egg*—and not the chat. She is *directing*, and the chat's choice is subsidiary. After all is it not rather like

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an artist and his paintings? The variations in his painting—slight differences in tone and colour—nuances—may seem purposeless and without meaning to others who view the finished picture, but to the artist they are his very work and full of an intimate significance. If therefore you prefer to see a possible meaning and design in individual variations rather than none you will not favour the *desertion theory*.

Biologists have always ridiculed the idea that a bird could 'by taking thought' alter in any way its egg. If you mean during that bird's life-time, then I agree that the supposition is worthy of ridicule, though ill health and possibly unaccustomed food may give rise to abnormality in eggs in the life time of the individual. But if you suggest that 'by taking thought' a *desire* to a *particular* end is created within that individual, and that that *desire* to the same end is inherited by that individual's offspring, and again strengthened and transmitted to future generations, I do not see why the continued *desire* should not eventually begin to have a visible effect after the lapse of 10-100 generations or more.

Surely such *desire* is the main element in sexual selection—does not the very word 'selection' suggest a *desire*?

In the *desertion theory*, desire is shown when the chat refuses the cuckoo's egg. It does not desire to accept it—or, if you like, it desires to desert it. The transmission of acquired characters has given rise to much argument. But it is impossible to estimate the amount of desire that may be acquired within the life-time of the individual—and who shall say that some such desire acquired in an individual's life is not transmitted to the offspring? The original move in parasitism in cuckoos must have come from the cuckoo. A cuckoo's egg did not find its way by accident into another bird's nest. The cuckoo put it there—or in other words the cuckoo desired to put it there. The cuckoo then first showed desire—what is more likely than that such a desire should continue to play its part in the full evolution of cuckoo parasitism? Nature struggles persistently to its end.

I think that it has—that desire has been the chief factor—desire on the part of the cuckoo to imitate—in her evolution of complete mimicry. Natural selection working through desertion may have played some part too, but I cannot see it as having been a major factor in the mimicry.

I think that a bird can change the colour of its egg 'by taking thought'—if you give it long enough—say many generations.

The *desertion theory* demands a high percentage of desertions. I have never noticed many. I have found not more than about 3 per cent of nests containing cuckoo's eggs deserted. That is to say about the same percentage of deserted nests as one finds that do not contain cuckoo's eggs. Again those three deserted nests containing cuckoo's eggs may have not been deserted on account of the cuckoo's egg they contained at all—but to other causes such as cause birds to desert their nests—vermin or the passing of men and cattle—or an accident to the parent bird.

The problem is probably incapable of solution . . . but we are

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quite charmed to think about it. Exasperating to a man of exact science such problems must be—and to those of ordinary education who demand a reason—and only one reason for any perplexity—but full of fruitless delight to the biologist.

The Origin of Their Parasitism.

The cuckoos are classified into two groups, the parasitic and the non-parasitic. That classification is not necessarily a correct and natural one; it is only the best that mankind has been able to do so far. The entire classification of birds is more or less arbitrary, and probably very incorrect, for their natural descent cannot be made out when so many groups have become extinct in the long process of evolution. Besides the missing links, there are all the apparent affinities, that are not homologous, to confuse and obscure the zoologist who would attempt to draw up a genealogical tree for the *Aves*. Even within historical times, a number of species of birds have become extinct, so that a vast number of species must have been eliminated in the long ago of which there is now no record, not a trace.

If it is true that the parasitic and the non-parasitic cuckoos have been correctly classified together and associated, then it is interesting to speculate as to which of these two divisions is the older. Probably the non-parasitic are the older or of approximately the same period, for were they a more recent group it must be supposed that they were at one time parasitic and then have reverted to normal habits. Strong evidence would be necessary to convince one of that. Nature does not forgive—does not offer a second chance.

Perhaps cuckoo parasitism is of comparatively recent origin; and perhaps it arose independently in two, or more, groups of cuckoos—not in all its present forms from one stock.

It is more than doubtful if we shall ever be able to get an answer to the question as to how this extraordinary parasitism started, but that is only an incentive to the biologist!

As the simpler problems that the parasitic cuckoos set are slowly solved, this great fundamental question as to the origin of parasitism must loom out larger and larger to the enquiring mind. Or, it may be viewed as a comparatively simple problem—just how a habit started in a common group of birds! But the more it is considered the more formidable it seems, this question as to 'How did it start?'.

The very nature of birds, with their soft plumage and light bones and habits of flight, and life above the earth, preclude the finding of their fossil remains in any useful quantities, so that their history seems irretrievably lost. There remains only their embryology to suggest past mysteries—but it is indeed difficult to read, and can scarcely help us to trace a habit, such as parasitism, that leaves no structural modification behind to identify it.

The mind must set out on a wild flight of fancy to dream of the birds of long ago, when the species of today were in the making, and the cuckoos about to enter on their great adventure . . . of parasitism.

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Now it could never have been *chance* that started parasitism in the cuckoos. Chance seems to play hardly any part in Nature—we must look for *design* behind phenomena.

Birds never lay or deposit their eggs *by chance* in the nests of other birds. The few instances known in Nature of birds laying in other birds' nests are always deliberate and nearly always in the nests of the same, or closely allied, species.

Had the first cuckoo—had the first hundred thousand cuckoos—laid or deposited their eggs by chance in the nests of other birds *all the young cuckoos reared to maturity from those eggs, would, when the time came for them to reproduce their kind, have reverted to normal habits of nidification.* There would not have been born in them the quality of parasitism—they would have felt no urge to depart from the normal habit of making their own nest and hatching their own eggs.

We are then most certainly bound to suppose that parasitism did not originate by *chance.*

Had the cuckoos so utterly departed from the natural law as to deposit their eggs by chance in other birds' nests we see that their attempt at parasitism would never have survived the first generation.

We are then led to suppose that the cuckoos started their parasitism by *design*, by *desire.* They must be credited with some such powerful, and special impulse, to cause them to depart so far from the normal habits of nidification. This does not of course solve the problem of the origin of parasitism, but it is a step back in the history of parasitism—and one forward towards the insoluble.

Parasitism may have started in the long, long ago, by desire in a particular individual cuckoo—or in a pair of cuckoos, but it would seem more natural—less of chance—that the habit was evolved, more or less at the same time in the whole group of 'cuckoos' that were about to become parasitic. In other words that parasitism was not the freak, or chance, of a single bird, or pair of birds, departing from the normal but rather the culminating act brought about by an impulse or desire that had gradually developed in those species over many generations.

Had the parasitism started in a single bird, or in a pair only, the chances of the habit surviving would have been very slight—especially when the suitability of the fosterers had not as yet been tested and ascertained.

It is therefore reasonable to suppose that parasitism started on a wide front and over a large area by those particular species in which this urge—or desire to become parasitic had become so strong as to be ready for actual expression. It may too have originated independently in more than one species.

The next stage would be the placing of their eggs in the nests of other birds over a large area most probably. What were these eggs like? Were they of the primitive colour—white, or were they marked, or coloured, eggs peculiar to that species? Or had they even at this early stage a resemblance to the eggs of certain species of birds decided upon to act as fosterers? The latter idea

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may safely be discarded as it is generally believed that mimicry only results after considerable trial over ages during which it is gradually perfected. It could not well jump to perfection before being put to use.

It may be supposed then that the cuckoo's eggs were white (or any other colour you like) and were placed in the nests of either a certain species—or in nests of many different species—with special intention—or at random. But 'at random' suggests chance, and it is more probable that even at that early stage the cuckoos had marked down the particular species they intended to victimise. Or they may have placed their eggs in the nests of certain species especially chosen, and other eggs, *faute de mieux*, in other birds' nests, as they seem to do now, which is not quite the same as 'at random'.

It may be supposed then that the cuckoos at this stage—at the beginning of their adventure in parasitism—laid eggs that did not at all resemble the eggs of the birds they were about to try and dupe—for all birds lay eggs of a type peculiar to their particular species—and, also, that they laid eggs of a size normal for the size of their bodies.

Having given in to this *desire*, or urge, to be parasitic, and having actually placed their eggs in the nests of other birds, the next thing to consider is how the cuckoo's eggs became adapted eventually to those of the fosterers. If the first act of parasitism —the placing of their eggs in other birds' nests—was brought about by desire, what is more natural than to suppose that the ultimate perfection of parasitism—the mimicry—has followed also by reason of the same desire within the cuckoo—*that the mimicry has been slowly brought about by the cuckoo.* This does not preclude other factors from taking effect on adaptation—but they would seem to be of minor importance.

The first stage in the adpatation of a white egg to resemble, say, red, marked eggs of the fosterer would be supposedly the appearance of a single red mark on it, or a few red marks—there would certainly be no sudden jump to a perfect resemblance. Such changes and adaptations in Nature are believed to take place only gradually and over very long periods of time.

Now the first appearance of such insignificant markings would have no natural-selection value, and this makes the *desertion theory*—that resemblance has been brought about indirectly by the fosterer deserting eggs that contrasted violently with her own, difficult, if not impossible of acceptance. Thus we are led to believe that these first few markings on the cuckoo's white egg came into being by *desire* of the cuckoo. It is impossible to fix the exact origin of *desire* in any particular and former generation, it would be far too subtle and elusive a quality to be traced, but we may suppose it to have been long inherited and strengthened already—this desire to mimic and dupe—before being given visible effect to in this change of colour in the egg.

Given once the beginning of red markings the elaboration of them to resemble the fosterer's eggs, change in colour tone, and

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possibly size, would follow in due course towards a perfect mimicry by the continued inherent *desire* of the cuckoo to dupe.

It has been argued that assimilation is not necessary, and my own contention that cuckoos' eggs are accepted by the dupes—even when contrasting violently with their own eggs, points to there being no particular value in the mimicry.

Why then this elaborate mimicry that has taken such ages in becoming perfected, if it is to be eventually of no use?

I think Nature works to a given end with astonishing and elaborate care—with a wealth of detail—much of which appears to us to be superfluous. So, I think, the parasitic cuckoos, driven by the desire to completely dupe their victims, have perfected their mimicry *irrespective of what the small birds duped might think of it.* After all, how could the cuckoo know what the dupes would think of her (the cuckoo's) egg? She would not know. It would be best for her in her parasitism to take no chances but adapt her eggs to the chosen species of fosterer. She would complete her mimicry—whatever the dupes might think of it. This is what, I think, she has done.

I have a very strong conviction that birds have a wonderfully keen appreciation of *their own eggs* and little, or no appreciation, of any other eggs. They regard their own eggs in the light of their inherited 'unconscious memory'. Instinct gives them a full appreciation of their own eggs. With regard to other eggs, I think, they just recognize them as eggs—and nothing more. To attribute an appreciation of a bulbul's egg to a sparrow is to credit the latter with human reasoning.

In the case of the cuckoo, it is different since cuckoos have been studying their dupes' eggs over countless generations with the sole object of perfecting parasitism. Here is the exception—the cuckoo is the only bird that is interested in the eggs of certain other birds. She views them *with an inherited appreciation.* This is another argument against the *desertion theory*, as I feel you cannot attribute to the fosterer an appreciation of the cuckoo's egg, to do so is to attribute powers of human reasoning to the fosterer who has no inherited qualities to enable it to judge any eggs other than its own.

And now we get back to where we started from—the origin of parasitism!—the birth of the *desire*. It originated in the cuckoos presumably for the reason that it has originated in many other forms of life—the inherent urge, impulse, or desire of an organism to take advantage of any opening that occurs in Nature by which it may profit to advance itself in the struggle for existence. For an understanding of the struggle for existence and the dreadful suffering it entails to guilty and innocent alike, it is best to leap from Biology to . . . Buddhism—from this world . . . to the next.

There are two, further and significant facts for consideration that I omitted to mention previously, that would appear to support my opinion that the resemblance of the cuckoo's eggs to those of the chosen fosterer has come about by reason of forces—however mysterious and incalculable they may be—that act *within* the cuckoo, rather than by forces of an external Natural Selection

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such as the *desertion theory* demands—a selection I consider unnatural—rather than 'natural'—since it tends to the disadvantage of the selector—the fosterer bringing about its own ruin.

The first, is the fact that the eggs of any particular, individual hen cuckoo are marked in such a particular manner, and are of such a particular character, that they are at once distinguishable and recognisible as the eggs of that particular hen cuckoo and no other.

Secondly, is the fact that the Drongo Cuckoo (*Surniculus lugubris*) resembles to such an extraordinary degree the King-Crow that it is generally accepted as a case of direct mimicry.

Now oologists agree that the marked eggs of any particular hen cuckoo bear such a close resemblance to each other that they can be safely assigned only to that particular, individual hen cuckoo. In some cases this particular and individual character of the eggs is so marked that it would appear to detract somewhat from the quality of their resemblance to the eggs of the fosterer. It would appear in such cases that the individual character of the eggs was of almost equal importance as their resemblance to those of the fosterer.

What is the significance of this marked individuality in the eggs of a particular hen cuckoo? It does not help in adaptation. On the contrary it tends to distinguish, and so interfere with complete adaptation. It cannot then be accounted for by the *desertion theory*—in other words it is not due to the fosterer. It must then be due to the cuckoo. It is natural to suppose that such an individual character to its eggs is required by that particular cuckoo for purposes of recognition—to distinguish its own particular eggs from those of any other bird. What other significance could it have but one of distinction? As a cuckoo does not place more than one of its eggs in any one nest, it is natural to suppose that it has a need to be able to distinguish and recognise its own eggs. Their individuality, their characteristic distinction from other eggs, enables the cuckoo to see at a glance whether it has already laid in a nest or not. In this connection it is interesting to note that as often two, or more, cuckoo's eggs are found in one nest—all laid by different individual cuckoos—it would appear that a cuckoo is not able to recognise another cuckoo's egg!

If the cuckoo has evolved *within itself*—over a great number of generations—those particular markings and colouration and type that give a distinguishing character to its eggs—is it not natural to suppose that the other remaining and incorporated character of her eggs—that tend to make them resemble those of the fosterer—are also derived from forces working within the cuckoo?

In the case of the Drongo Cuckoo there is said to be a remarkable resemblance in both form and colour to the King Crow. Is this not a case of mimicry? If so how has the mimicry arisen?

According to the *desertion theory*, I suppose, the likeness has been brought about by the King Crow!—to its own disadvantage and ruin!

I would rather think of it as a case of direct mimicry on the

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part of the cuckoo—over untold generations—working to its profit and advantage in its parasitism. If this is so—that a cuckoo can, over untold generations, so alter its whole form and colouration so as to mimic the King Crow—to help it to perfect its parasitism on the King Crow—why should not its egg also reach a similar mimicry from similar forces of desire acting in the same manner within the cuckoo to the perfection of parasitism?

If the mimicry of the bodily form is admitted why not too in the egg? Is not the egg a part of the body?

Undoubtedly many of the minor problems that the parasitic cuckoos set us will be solved in the near future by intensive observation on the part of an increasing number of naturalists, aided by photography, and possibly the keeping of various parasitic cuckoos in captivity. But will the major Cuckoo Problems ever be solved? Almost certainly not. Then why enter into a profitless speculation of the Unknown and Unknowable? Because it is Man's pleasure! and on the way lie the minor discoveries that lighten the path to understanding. Biological thought plunges far beyond the cold, ascertained facts of Science—nor will any intelligent man be denied the fantasy of thought into the Beyond.

Ornithology is not worthwhile unless it leads beyond mere measurements in millimetres of faded bird skins and the 'creation' of super-subspecies is the honour of colleagues.

The obejct in opening the subject of Cuckoo Problems is to stimulate the interests of naturalists, to their own advantage—to the enrichment of their life, and the solving of minor problems connected with cuckoo parasitism, and to provoke thought on the major and insoluble problems.

I regret that my name must be subscribed to what I have written. The interest in Ornithology is in *birds* and not in the people who write about them—and above all in *live birds*—the courtship and nidification and embryology of which form the secret and intimate and most significant part of their life.

Since writing the above I am very pleased to say that I have made quite a sensational discovery that should interest all naturalists—since it is a discovery of fact, and not opinion. Profiting by the invaluable information conveyed in Mr. Chance's book, *The Cuckoos' Secret*, I was able here at Taunggyi, on April 24, *to witness by design the cuckoo depositing its egg at an inaccessible nest of the Stone Chat.*

An account of this interesting act of parasitism will be published in the *Journal* shortly. I claim that it is the most important cuckoo discovery since Mr. Chance's work in 1921. I claim too that it is the first time that the act of parasitism has been observed at an inaccessible nest. Primitive man never had the advantage of Zeiss field glasses! The chat's nest was 5 yards distance from my hide, and with the glasses set at +5 the act took place in my very presence.

Comment by E. C. Stuart Baker.

The Editors of our *Journal* have asked me to write a commentary on the interesting paper written by Mr. Livesey on 'Cuckoo

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Problems' and the origin of Cuckoo Parasitism. This is not an easy matter to do and it is rather like asking someone to answer one conundrum by setting another. So many of our cuckoo problems are still matters of personal opinion, while many people think they have solved these problems in perfectly different ways. Mr. Livesey has dealt, more or less, with many problems. He asks, 'Is the foster parent attracted to, or frightened by, the cuckoo? In what way, or ways, does the cuckoo deposit its egg in the nest? What interest does the male bird take in deposition, etc.? Why are the fosterer's eggs removed from the nest?' All these are questions of interest but it would take a volume to answer them so I restrict myself, for the present, mainly to an attempt to answer his theory as to the evolution of the cuckoo's egg, referring very briefly to the other problems.

Mr. Livesey and I have very different ideas as to how the adaptation of cuckoos' eggs to those of their foster-parents has been brought about. Either of us may be right or both of us may be wrong but, if between us we write something which will make other people think, then we have done something worth doing however much these same people may disagree with the conclusions we have arrived at.

I have had the pleasure of knowing Mr. Livesey now for many years and I know him to be an exceptionally keen and intelligent observer of all forms of Nature, so that anything that he makes up his mind to write about, will almost assuredly give us something worth, both reading and fully considering.

Mr. Livesey states, I think quite definitely, that he considers the main factor in the production of any cuckoo's egg of a type, colour or character similar to that of the foster-parent, in whose nest she deposits the egg, to be the cumulative effect of a *desire* to produce that particular colour of egg held by that particular line of cuckoos for many, it may be countless, generations. I do not think that Mr. Livesey wishes us to believe that *desire* is the sole factor for, in one of his letters to me on the same subject, he remarks, 'I do not say that environment does not assist the cuckoo in bringing her desire to perfection', while, perhaps also, he would admit certain other factors as having a greater or lesser degree of weight in the same direction.

Now my own belief is that the adaptation of the cuckoo's egg has been evolved by methods which are those relied on in the very crudest form of Darwin's theory of the survival of the fittest; i.e. I think it has been brought about by the gradual elimination of the eggs showing the greatest contrast to those of the fosterer and the hatching and rearing of those nearest in adaptation.

Unfortunately in an article of this nature and of the length, within the limits of which I must keep, it is impossible to deal very fully with such an intricate problem as that which has been set before us. I can, therefore, here only consider a few of the major points.

Let me first try to show what I consider to be the weak point in Mr. Livesey's theory. When we come to consider cuckoos'

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eggs we have to remember that there are a very vast number of cuckoos which produce a far vaster number of eggs, among which are many which have acquired what I term 'assimilation', either perfect or complete, advanced, incipient, or none at all. Obviously we may consider that those birds whose eggs have reached the most perfect stage in evolution are those which have been longest employed in attaining it, whilst those cuckoos, in which there is little or no evidence of assimilation between their own eggs and those of the foster-parent, are those which have been the latest to commence the acquirement of such assimilation.

When we study this particular point we find that the Common Cuckoo at the furthest point of its range north-west is that which appears to have reached the least perfect stage of evolution in its eggs. It is not until we study the oology of some of our more primitive sedentary cuckoos, such as those of the genus *Clamator*, that we can envisage an apparent finality of evolution. Amongst these various degrees of adaptation we find the most extraordinary evolution in colour, the results being often the same in genera widely separated. Thus, in what I have termed the perfect or complete stage we find certain cuckoos (*Clamator*, *Hierococcyx*) laying blue eggs which, even to the human eye, can hardly be distinguished from those of the birds which it normally 'cuckoos' (*Argya*, *Turdoides*, etc.). In another instance we find an almost equally final stage in which one species of cuckoo (*Hierococcyx sparveroides*) lays two types of egg, brown eggs which it deposits in the nests of birds which also lay brown eggs, or blue eggs which, in the same manner, it deposits in the nests of birds which also lay blue eggs.

Another similar dimorphic evolution is that shown by the Little Himalayan Cuckoo (*Cuculus himalayanus*) which lays red eggs in one area and in another white. In each of the above five instances the birds have attained a stage of evolution which, because it is sufficient for its purpose, may be termed either complete or perfect, yet these five colours have sufficed for all their purposes.

Must we then imagine that out of the many millions of cuckoos which have laid these eggs only the five colours, pale-blue, dark-blue, brown, red or white, were *desired* by these birds and that no one strain among such countless thousands *desired* grey, yellow, pink or any other particular colour? Such a reasoning seems to me weak, in that among so great a number of individuals we would hardly expect five colours to embrace all their desires.

We can, however, go even a little further than this. Let us consider the eggs of the Little Plaintive Cuckoo (*Cacomantis merulinus*). This is a bird which lays eggs which I have called polymorphic in their colouration. Over the greater part of the enormous area occupied by this little cuckoo from West India and Ceylon to Eastern China it lays two types of egg, white or pale blue, spotted or blotched with various shades of red and red-brown. Over this same extent of country the eggs are normally deposited in the nests of small warblers of the genera *Orthotomus*, *Franklinia*, *Suya*, *Cisticola*, etc., and, roughly speaking, these

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warblers lay similar white or blue eggs somewhat similarly marked.

If we take these areas one by one we find that further modifications of the cuckoos' eggs in character and markings have taken place and, in every instance, these modifications tend to increase the likeness between the eggs of the cuckoo and those of the foster-parent specially selected in that area. Thus in Hongkong, the Plaintive Cuckoo hardly ever places its egg in any other nest than that of the Tailor Bird (*Orthotomus*), while here also the great majority of Tailor Birds lay pale blue eggs with blotches. Accordingly the eggs of the cuckoo are nearly always pale blue and distinctly blotched, being so perfect in their assimilation that but for their larger size and different texture they would be most difficult to distinguish.

In Siam, much the same thing obtains but here the cuckoo also makes use of the nests of Franklin's Wren Warbler (*Franklinia*) which lays eggs which are generally speckled rather than blotched and we find that two strains of cuckoos have been evolved, of which one strain lays blotched blue eggs to place in the Tailor Bird's nests, while the second lays speckled blue or white eggs to place in those of Franklin's Wren Warbler.

Working through to India, its hills and plains from North to Central India, we find the blotched eggs gradually disappearing and the speckled eggs increasing in number and we also find that these latter are placed in the nests of *Suyas* and *Cisticolas* which also lay speckled eggs.

In the Nilgiris and in some other parts of Southern India this little cuckoo deposits its eggs in the nests of common Wren Warblers which lay deep blue eggs with dark blotches and we find also the astonishing fact that the cuckoo lays eggs which are deeper blue and more darkly blotched in this area than in any other part of its habitat and so here, too, assimilation has been advanced to suit special characteristics.

Finally we have an even more extraordinary result obtained by environment (as I believe it to be) in the Hyderabad district of the Deccan.

Generally speaking the Plaintive Cuckoo is a bird which prefers very wet, wet or moist climates and is not found in exceptionally dry areas of Sind, the Punjab and Rajputana, yet there is one dry area, that referred to above in the Deccan, in which this little cuckoo is exceptionally common. Here it has probably been driven by competition and by excessive cuckoo population from all the surrounding wetter areas and it has had, therefore, to find new foster-parents to take the place of those generally cuckolded in the less dry countries. The bird it has selected is the Little Ashy Wren Warbler (*Prinia socialis*) which is certainly the most common of the warblers round Hyderabad. This little bird, however, lays a brilliant dark red egg and necessity has evolved a red cuckoo's egg to agree with it.

Red eggs of this cuckoo are only to be found within a very small area, possibly some 50 miles across one way and very much less if measured from east to west. It is placed exclusively in

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nests of the Ashy Wren Warbler and never in the nests of those birds which the cuckoo usually victimises elsewhere. Surely here we have an instance in which the dominating factor seems to be the necessity of laying eggs suitable in colour to agree with that of the foster-parent and not a sudden desire of the cuckoo to lay a red egg.

If the Plaintive Cuckoo *desires* to lay a red egg in this one small area is it conceivable that in the many hundreds and thousands of square miles over which the species lays, no other individual bird has ever been seized with a similar desire? On the other hand we have in the gradual elimination of unsuitable eggs, apparently an obvious method by which the evolution of red eggs has been acquired. It seems to me that when the Plaintive Cuckoo was first forced to enter an area in which, *suo motu*, it would never have entered, it at once selected as prospective foster-parents, birds whose nests were very similar in appearance and suitability to those of its former foster-parents outside this area. Among the great number of eggs laid by these cuckoos it may have been that there were a certain number with a slight tinge of pink in them, such indeed as we sometimes see even in eggs deposited in other parts of India. Among these were some more pink than the rest and these, when placed alongside the eggs of the Ashy Wren Warbler contrasted less violently than the others. Some accordingly escaped destruction (in this case desertion) by the foster-parents. The birds hatched from these eggs would again lay eggs very similar to them and amongst the variations which we know to occur in all birds' eggs, a few again would be yet more decidedly pink than those of the preceding generation.

In each succeeding generation this process would continue, the reddest eggs in each escaping desertion in greater proportion than those not so well adopted, until, eventually, we should find that the suitable eggs predominated and the unsuitable ones were few and far between.

Professor K. Burnett who collected a wonderful series of eggs of this little cuckoo, most of which he very kindly handed over to me, told me that both the Little Cuckoo and the Ashy Wren Warbler were extraordinarily common round about Hyderabad. I asked him, accordingly, if he thought he could collect for me two series of eggs grading from those similar to the eggs of the same species of cuckoo laid outside the Hyderabad area up to the almost perfectly adapted red egg. Mr. Burnett went to immense trouble to obtain two such series, each containing about a dozen eggs graded as I had asked him. He, however, told me that while it was very easy to get the fully red eggs, it was very difficult to get those showing an approach to the normal outside types. Indeed, when I finally received these series I found that there was no egg which was quite identical with the normal type or types, although there were one or two which I could match with unusually coloured eggs laid by birds elsewhere. There is yet one other point in interest in connection with these red eggs of the Plaintive Cuckoo and that is the fact that spots, specks and blotches have almost entirely disappeared. The only markings

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ever seen are a very faint ring or zone of the deeper darker red round the larger end or, in a very few cases only, an indistinct mottling of red rather darker than the ground colour.

Now if we take in review all the various types of egg laid by the Plaintive Cuckoo over the whole of the area in which it occurs, we find the following action has taken place. Three main types of eggs have been evolved: (1) white, variously marked; (2) blue, equally variously marked; (3) red, unmarked or very slightly marked. As regards the ground colouration, whether white, blue or red, in each case this special colour is the same as that of the eggs of the bird in whose nests the cuckoo's eggs are deposited, and further, we find that not only has a definite colour been evolved but that especial characters of spots, specks and blotches have also been evolved to suit those particular types of eggs with which they have to compare.

If Mr. Livesey's theory of *desire* is correct then we must admit not only that cuckoos can by desire attain any colour in their eggs they wish for but that they can also, by desire, attain modification in depth of colour and variations in the character of the markings.

Surely Darwin's theory is easier to believe, easier to explain and more satisfactory in every way and from every point of view from which one can consider this marvellous adaptation.

I was once told by a clever, but rather young, biologist, who in his anxiety to criticize had not troubled to listen to what I had said, that it was high time pompous old gentlemen ceased to lay down the law on various scientific matters. On that occasion what I did say was that I hoped that no one would take any one law as governing the whole question of evolution but would remember that while many theories such as those of Mendel, Bateson and others were, or might, all be true, yet they were each but one factor in evolution, the results of which were modified by environment as a whole.

In the present instance I again make no assertion that I am right and all I do is put forward my evidence and leave it to the reader to determine, if he can, who is right and who is wrong.

Before I leave this problem of adaptation I must refer to three very important letters which seem to throw an extraordinary light on this question of evolution. They were written by gentlemen, all keen observers, and absolutely without any desire to prove or disprove any particular theory. The first letter was written to find out if anybody could give the reason why the Ashy Wren Warbler, which in previous years had been found to be much the most common bird in Hyderabad, had suddenly disappeared. The second letter was written asking if anybody could say what species the little cuckoo was which the writer had found laying freely in the nests of the Common Wren Warbler and in the nests of *Franklinia, although in every case the nests had been deserted.* Yet a third letter refers to two eggs of this little cuckoo, similar to eggs of the Jungle Wren Warbler laid in the nests of the Ashy Wren Warbler and promptly ejected and to other red eggs

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deposited in nests of the same warbler which were accepted, hatched and reared.

From these three letters we can perhaps conclude that some sudden disease having practically wiped out the Ashy Wren Warbler, the cuckoos, which had not been affected by the same disease, had to lay their eggs in some other birds' nests. Naturally those they selected were those of the birds which, outside the Hyderabad area, had previously generally provided their victims but, the red eggs of the cuckoos having been evolved to the practical exclusion of all other types, they were no longer suitable when contrasted with the eggs of the Common Wren Warbler or of *Franklinia* and, in consequence, the vast majority were deserted. It is probable, however, that among the red eggs which had now become the stable form, a few would be found less brilliantly red than the others and, these being less conspicuous, would be hatched, so that eventually we should have a process exactly reversing that which had occurred to produce the red eggs, until eventually these latter had been wiped out and we had a complete reversion to the white and blue spotted and blotched eggs laid by all other Plaintive Cuckoos. Here is a most interesting fact in the biology of the Plaintive Cuckoo which I sincerely trust some of our bird-loving residents around Hyderabad will do their best to confirm or refute.

Another cuckoo of which we at present do not know very much, the Himalayan Cuckoo, lays pure white eggs very faintly speckled with black or dark brown and, so far as we know, no other type is ever produced. The eggs are deposited in the nests of the numerous small warblers of the Western Himalayas, which also lay white eggs, either immaculate or faintly speckled as are those of the cuckoo. Here I suppose Mr. Livesey would say that the cuckoos do not lay white eggs because the others have been eliminated by the foster-parents but merely because in this particular species of cuckoo there are no individuals who ever desire to lay coloured eggs of any kind whatsoever.

It will be seen from what I have written above that if Mr. Livesey's theory of *desire* is the correct one we have the following points which must be conceded in addition to the primary one of desire. First, that having produced an egg not only of the colour but with markings of a certain character, the cuckoo then proceeds to select for the disposal of her eggs the nests of some other species of birds which lay very similar eggs. Here we seem to have a very striking contradiction. Admittedly most cuckoos do lay eggs which approach more or less closely in appearance to those of the foster-parents but if desire only on the part of the cuckoo is the factor causing this special colour and appearance, why is it that they so often are found in the nests of birds with similar eggs? Surely this would be utterly unnecessary unless the foster-parents had some power of discrimination and the cuckoo was afraid of her egg being unhatched or evicted. If she was so afraid, then the necessity for assimilation is at once apparent and if discrimination on the part of the fosterer and the necessity for elimination is admitted, we are at once back to the original

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position, that whatever the *desire* of the cuckoo may be, as to the production of any particular colour in its eggs, the eggs which are unsuitable will die out, while those which are more fitted for their purpose, i.e. assimilation, will continue, and we once more realise that the discrimination of the foster-parent is really the deciding factor. The only other alternative one can visualise is that throughout every cuckoo's life the most remarkable continuation of coincidences goes on—*quod est absurdum*.

Having reviewed the portion of Mr. Livesey's papers dealing with assimilation of cuckoo's eggs to those of the foster-parents and its cause, I can only touch very briefly on his other points. As regards the alleged hawklike appearance of the cuckoo, I can say very little. It is quite true that the cuckoo is often mobbed by small birds but this I think may well be not because it resembles a hawk but because it is a cuckoo, for there are other cuckoos, such as the birds of the genus *Clamator*, which bear no resemblance to hawks yet are frequently mobbed by small birds, especially during the breeding season.

The squamated appearance of the Common Cuckoo on its under plumage may quite possibly be explained as Mr. Livesey suggests. The idea is certainly ingenious.

Mr. Livesey's next theory to which he draws our attention is that so far from most birds being opposed to or intolerant of the cuckoo and its unpleasant habits, they are really only too proud to hatch and bring up a youngster so superior to their own. If, however, we examine carefully Mr. Livesey's reasons for thinking as he does, the behaviour of the bird as referred to by him might equally well show fear and anxiety rather than, as he suggests, fascination and attraction. Moreover, there is one little fact that Mr. Livesey does not allude to which is that very often small birds when they attack the cuckoo have been seen to pluck feathers from its back. One would not think that this would prove very attractive to the cuckoo.

Then Mr. Livesey goes on to discuss the method in which the cuckoo deposits the egg in the nest of the fosterer. To me this is not a very exciting problem though it is one which can only be dealt with at very great length, for it requires the accumulation of much evidence and cannot be dismissed as proved one way or the other. Here I would merely say that I am on the whole very much in agreement with Mr. Livesey. It is within my personal knowledge that eggs of cuckoos are frequently found in places where she could not possibly lay them directly into the nest yet Mr. Chance has proved to everybody's satisfaction, except that of Mr. Bunyard, that the cuckoo does, at all events sometimes, lay her eggs direct into the nest of the bird she victimises.

I should perhaps draw attention to a certain accepted fact as it is one of those which assist the theories of those who say that *all* cuckoos place their eggs in the nests in the manner described by Mr. Chance. This is the fact that the cuckoo is exceptionally supple and can for its size, get into smaller places than other birds of similar bulk. Thus I think Mr. Livesey's statement that he judges of the possibility or the reverse, of entrance by the

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cuckoo to the nest-hole by whether they are less than the width of his hand, cannot be relied on. At the same time Mr. Livesey has found many nests with their entrances far smaller even than this into which it is quite certain no cuckoo could have possibly entered.

Just as I was folding this paper up to go to the post I have received a most interesting letter from Mr. Livesey in which he writes: 'On the other hand my theory allows me to suppose that cuckoos finding that they have for some reason (such as extending migration) no suitable fosterers at hand to victimise, must adapt themselves to some other species (that has never yet been duped) or else try to continue unadapted. They would note red eggs of *Cettia* and recognise the need to imitate them, i.e. lay red eggs. Many cuckoos would begin to feel this urge' and then he goes on to say that with each succeeding generation this *urge* or desire would increase 'until after some generations the first red tinge in their eggs would appear as a visible expression of desire' to be repeated and added to until a fully red egg would express the fulfilled desire of countless generations.

Although I cannot, even now, agree that Mr. Livesey's theory of 'desire' or 'urge' is the dominating factor in the evolution of the cuckoo's egg, the above paragraph in a few lines adds so much to the scope of the theory as elaborated in his previous letters, that it is well worth repeating.

What a wonderful world this would be, or will be, if 'desire' or 'urge' to produce beautiful women and fine men could be given effect to for in every woman is an innate 'desire' or 'urge' in this direction.

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THE ORNITHOLOGY OF TRAVANCORE AND COCHIN.

BY

SÁLIM ALI.

With Notes by HUGH WHISTLER, M.B.O.U.

PART V.

(*Continued from page 514 of this volume*).

FAMILY: MOTACILLIDÆ.

Motacilla alba dukhunensis Sykes. The Indian White Wagtail.

Specimens not procured by the Surveys but there are two in the Trivandrum Museum as follows: ♂ 22-12-03 Kayankolum Bar; ♂ 17-1-03 Alwaye.

Met with by the Cochin Survey only at Ernakulam, and there only a single bird on a grassy patch near Maharaja's College (3 January). It is a winter visitor, of course, and apparently very rare. Ferguson states that he collected specimens both at Peermade and the High Range and again in the low country at Alwaye in North Travancore, in January 1901 (*J.B.N.H.S.*, xv, 471). It has been recorded from Ceylon.

Ticehurst (*J.B.N.H.S.*, xxviii, 1089) gives the distinguishing character of the race *dukhunensis* as having the ear-coverts white at all seasons as against the next race *personata* which has them black at all seasons. This is usually an excellent clue to their differentiation in the field.

Motacilla alba personata Gould. The Masked Wagtail.

Not met with by the Surveys. There is a specimen in the Trivandrum Museum labelled ♂ 21-1-01 Moonar. Mr. Whistler comments on this as follows: 'According to the *Old Fauna* this wagtail was known to extend as far south as Belgaum, and I have not traced the original record on which the *New Fauna* (iii, 260) states that it occurs as far south as Travancore. The fact is, however, now proved by this specimen which was labelled by Ferguson *Motacilla alba*.'

Ferguson's statement under *dukhunensis* (supra) that he collected it on the High Range is obviously based on this specimen which Mr. Whistler points out is in reality *personata* wrongly labelled. That statement must therefore be referred to the Masked Wagtail.

It does not occur in Ceylon.

Motacilla maderaspatensis Gmelin. The Large Pied Wagtail.

Specimens collected: 173 ♂ 28-1-33 Sānthanpāra 3,500 ft.; 701 ♂ imm. 21-7-33, 751 ♂ 30-7-33 Beach, Trivandrum.

Elsewhere noted at: Mūnnār (5,000 ft.—High Range); Thattākād (200 ft.); Kottāyam (ca. S.L.); Kūmili (3,000 ft.); Kollātūpūzha (ca. 300 ft.); Velayāni Lake (Trivandrum Environs); Cape Comorin (ca. S.L.); Arāmboli (250 ft.); Kūriārkūtti (1,600 ft.—Annemalāi Hills); Wadakkāncheri (400 ft.); Karūpadanna and Ernakulam (ca. S.L.).

Colours of bare parts: Iris brown; bill, legs, feet and claws horny-black (slaty in immature No. 701); mouth slaty-pink in adult, pale flesh colour in immature.

[Other specimens examined:

B.N.H.S. Coll.: ♂ 21-2-94 Trivandrum; ♂ 16-12-91 Travancore; also a small Travancore series in the British Museum.

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Measurements:

	Bill.	Wing.	Tail.	Tarsus.
5 ♂♂	19-20.5	98.5-99	98-105	26-27.5 mm.

This species has no races. The adult male is always pure black and white in colouration. The adult female has two phases (1) exactly like the adult male in colour, though of course slightly smaller in size; (2) differing from the adult male in having the black of the upper parts including the lesser and median wing coverts replaced by dark sooty-grey. This plumage is assumed at the second autumn, i.e. when the bird is about fifteen months old. The post-nuptial moult is complete and there appears to be no spring moult, summer and winter plumage being therefore alike.

The male and female in their first year are alike and closely resemble the second phase of adult female colouration. They can, however, be usually distinguished from the latter by the presence of the wing-feathers retained from the juvenile plumage and by the fact that the accidental moult of odd feathers tends to make the dark sooty-grey of the upper parts blotched with black in some specimens.

The juvenile plumage follows the same colour pattern as the first-year birds; the black or dark sooty-grey of the body and coverts is, however, replaced by ashy grey-brown, and the white parts of the plumage are washed with creamy fulvous. The quills of the wing and tail are a much browner black than in the adult.

The post-juvenal moult does not appear to be ever quite complete, but the extent to which it embraces the wings and tail appears to be variable.—H. W.]

The Large Pied Wagtail is a fairly common resident species in both Travancore and Cochin. Ferguson says (*J.B.N.H.S.*, xv, 471) that it does not ascend the Travancore hills, but the Surveys found it from the neighbourhood of the backwaters and coast up to 5,000 ft. elevation. I suggest that it usually prefers the low country to the hills on account of its predilection for more or less smooth-running streams in open country rather than hill torrents, and that it occurs wherever such are to be found irrespective of the elevation. The birds are usually seen in pairs, never very widely separated, tripping lightly over stones in the stream bed or on its banks and calling in sweet, clear whistling notes. It was also observed by irrigation tanks and pools, and frequently on stakes, moorings and jetties in the backwaters. Large numbers roosted in company with other wagtails and swallows on the reedy islets in the backwaters. At Mūnnār a favourite roost was the tangled growth overhanging the banks of the Mūnnār stream near the Club.

In the Palni Hills, Terry (*S.F.*, x, 477) noted this wagtail at the end of May by the side of a stream at Pumbarrah [elevation?]. It is said to be an extremely rare straggler to Ceylon.

Breeding: On 29 November a bird was observed carrying nesting material to the top of a masonry pile of the old railway bridge across the Shoranūr River (Cochin). Another pair were trying to build on a rafter under the eaves of the Travellers' Bungalow at Mūnnār on 16 January. On the Periyār River at Thattākād (11 February) two juveniles with ashy grey-brown backs were observed being fed by adult birds. Courtship was in progress generally at this time and males were singing from rooftops, rocks in river beds, etc. On 16 February a pair were observed in copula on the ground in the compound of the Travellers' Bungalow at Kottāyam. The preliminaries consisted of the male puffing out his plumage and with outstretched wings raised vertically back to back, approaching the female, singing excitedly the while. The female ducked somewhat, at the same time elbowing out her wings laterally, and shivered as when asking to be fed. The male hopped lightly but rigidly on to her back from behind, she dipping her posterior somewhat to accommodate him and thus coitus was effected. These proceedings took place in the morning at about 8 o'clock.

Ferguson states that in Travancore this wagtail breeds at the end of the year. The skull of a specimen—No. 701—was reported by Mr. Pillai to be imperfectly ossified as late as 21 July.

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Motacilla cinerea caspica S. G. Gmelin. The Eastern Grey Wagtail.

Specimens collected:—61 ♂ 11-1-33 Marāiyūr 3,000 ft.; 137 ♀ 23-1-33, 198 ♀ 31-1-33 Sānthanpāra 3,500 ft.; 335 ♂ 22-2-33 Peermade 3,200 ft.; 866 ♂ 14-11-33 Kūriārkūtti 1,600 ft.

Elsewhere noted at: Mūnnār (5,000 ft.—High Range); Thattākād (200 ft.) Kūmili and Periyār Lake (3,000 ft.); Camp Derāmalāi (3,000 ft.); Tenmalāi (500 ft.); Nemmāra (300 ft.—only a single !); Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris brown; bill horny-brown, paler at chin and on commissure; mouth pale yellowish-pink; legs and feet brownish-flesh colour; claws dusky.

[Other specimens seen:

Brit. Mus. Coll.: ♀ 13-4-75, ♂ 5-11-78, ♂ 8-11-78, ♂ 4-12-78 Mynall, Travancore (Bourdillon).

Measurements:

	Bill.	Wing.	Tail.
3 ♂♂	16-17	83.5-87	91-95 mm.
2 ♀♀	16-17	79-82	88-88.5 mm.

In this form the male and female in winter plumage are alike, the adults and first winter birds being separable only with difficulty by the fact that the latter retain the worn primaries and primary coverts, secondaries, sometimes the tertiaries, and the greater and median coverts of the juvenile plumage. The adult males average a deeper brighter yellow and the first winter males average a paler and less generally distributed yellow on the lower parts, but there is a good deal of variation and individual birds could hardly be picked out. In fresh plumage there is a variable amount of green wash on the upper parts, but this gradually wears off. There is apparently a pre-nuptial moult usually confined to the body plumage but sometimes extending to the tertiaries and central tail feathers. In breeding plumage first summer females do not appear to differ from the above general winter plumage, but adult females have the white of the chin and throat more or less variegated with black. The males on the other hand become a rather purer slate-grey on the upper parts and ear-coverts, the supercilium becomes purer white, the chin and throat become black leaving a white malar streak on each side, and the lower parts become a deeper more uniform yellow. The feathers of the black throat-patch may be fringed with white which gradually wears off. First-year males may then only be distinguished with difficulty by the worn appearance of the juvenile feathers of the wings and tail. The post-nuptial moult is complete.

The juvenile retains the general colour pattern of the adult winter plumage, but the greater and median wing coverts are edged with buff, the yellow of the lower plumage is very pale and the breast is washed with buff. The post-juvenal moult does not include the primaries and primary coverts, the secondaries and greater and median coverts, nor usually, I think, the tertiaries and tail.—H. W.]

The Grey Wagtail according to Ferguson (*J.B.N.H.S.*, xv, 471) is one of the earliest winter visitors to arrive in Travancore where it stays well on into May. The latest date on which I have a sight record is 25 March, and it was noted that by 27 April when the next suitable locality in the hills (Balamore Estate) was visited, it had completely disappeared. Kinloch (*J.B.N.H.S.*, xxvii, 941) writes that in the Nelliampathy Hills it arrives early in October and leaves in early March. Although exceptionally met with at lower elevations, Ferguson is correct in saying that it is found only in the hills from about 1,000 ft. upwards. Coming down the Mūnnār Ghat, single Grey Wagtails, which were being constantly put up from the road by our motor bus, disappeared conspicuously below this elevation. Similarly on the road from Kottāyam (ca. S.L.) to Peermade (3,200 ft.) our bus encountered the first of numerous subsequent Grey Wagtails only at Mundakāyam ca. 1,200 ft. In the hills of both Travancore and Cochin the birds were common. They were invariably met with singly, running about and feeding on roads and paths through secondary evergreen as well as bamboo forest, and especially through tea, coffee and cardamom plantations. Often also by

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forest streams and trickles. On one occasion several Grey Wagtails were observed hawking insects over a steep fall in the Parambikolam River. They launched aerial sallies after them from the adjacent rocks and turned and twisted in the pursuit with great agility.

In specimen No. 61 the left wing was a mere stump with the carpal region and primaries missing. In spite of this deformity—evidently congenital—the bird flew with little apparent difficulty, though when taking off the movement was somewhat lop-sided or rotatory as in a dove suddenly frightened off the ground. It is remarkable that even with this obvious handicap the bird should have successfully accomplished its long migratory journey and reached almost the southernmost extremity of its Indian range.

This was the only species of migratory wagtail observed in the hills of Travancore and Cochin.

Terry (*S.F.*, x, 477) records it from the Palni Hills where its status is presumably the same as in our area. It is a winter visitor to Ceylon from the middle of September to the end of March.

Motacilla flava thunbergi Billberg. The Grey-headed Wagtail.

Specimens collected: 282 o? 15-2-33 Vembanād Lake, Kottāyam Backwaters; 521 o? 7-4-33, 558 ♀ 10-4-33, 584 ♂, 585 ♂ Cape Comorin (ca. S.L.); 608 ♂ 17-4-33 Arāmboli 250 ft.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
3 ♂♂	16	82-85.5	75-77	23-24.5 mm.
1 ♀	16.5	80	—	22 mm.

Not previously recorded from Travancore though a common winter visitor to Ceylon.—H. W.]

Motacilla flava simillima Hartert. The Short-tailed Grey-headed Wagtail.

Specimens collected: 609 ♀ 17-4-33 Arāmboli 250 ft.; 1039 ♂ 29-12-33 Karūpadanna ca. S.L.

[This race—the *Motacilla flava* of the *Old Fauna*—was omitted entirely in the *New Fauna* but restored with a brief notice in vol. viii, 660. It is the breeding form of Kamschatka and is well known to winter in Burma (cf. *J.B.N.H.S.*, xxxvi, 931) but this appears to be the first record of the race in South India, providing another interesting illustration of the fact that Travancore winter visitors are apt to arrive from the eastern side of Asia. The very dark ear-coverts and the pale superciliary stripe are diagnostic, and my identification has been confirmed by Dr. C. B. Ticehurst.

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
♂	16	83	69	24 mm.
♀	15.5	78	65.5	22.5 mm.—H. W.]

Elsewhere not noted.

Colours of bare parts (both races): Iris brown; bill horny-brown, paler (yellowish) on commissure and at base of lower mandible; mouth pale yellowish-pink; legs, feet and claws blackish-brown; soles yellow.

The Surveys found these two races of the Grey-headed Wagtail—not previously recorded from Travancore or Cochin—common and abundant in the low country, especially on the grassy banks and bunds and water-logged ploughed or fallow fields along the backwaters and by irrigation tanks. Both races occurred together gregariously, and no other migratory wagtails were noted with them. They were not met with in the hills at all. A specimen on 10 April and the two procured on the 17th of that month were very fat. They were undergoing pre-nuptial body moult, the rectrices and remiges being fresh. Flocks of 30 to 50 birds were common at this time, and it was evident that they were massing for the northward migration.

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Dendronanthus indicus (Gmelin). The Forest Wagtail.

Specimens collected: 222 ♀ 4-2-33 Thattākād 200 ft.; 374 ♀ ?, 375 ♂ 28-2-33 Kūmili 3,000 ft.; 879 ♂ 17-11-33 Kūriārkūtti 1,600 ft.; 973 ♂ 13-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Camp Derāmalāi (3,000 ft.); Rājampāra (1,350 ft.); Tenmalāi (500 ft.); Arāmboli (250 ft.).

Colours of bare parts: Iris hazel-brown to dark brown; bill upper mandible horny-brown, lower mandible pale flesh colour; mouth pale yellowish flesh colour; legs and feet brownish-flesh colour; claws duskier.

[Other specimens seen:
Brit. Mus. Coll.: ♀ 23-11-74, ♂ 12-11-78 Mynall (Bourdillon).

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
3 ♂♂	17-18.5	81-82.5	66.5-68	21-21.5 mm.
2 ♀♀	17	75-80	68	21 mm.—H. W.]

The Forest Wagtail is a well distributed but not abundant winter visitor to the States. Bourdillon says that it arrives in Travancore soon after the Grey Wagtail and stays nearly as long as that species. The last date of which I have a record is 21 April. It affects well-wooded country and in both Travancore and Cochin the Surveys came across it from about 200 ft. up to an elevation of at least 3,500 ft. A few birds were also observed at Arāmboli where they kept under a dense grove of *Acacia planifrons* surrounded by open cultivated country in the 'Gap' or pass through the southern extremity of the Ashāmbu Hills. These wagtails were usually met with singly or in widely separated pairs on footpaths and small clearings in forest, both evergreen and deciduous. Well-shaded plantations of coffee and cardamoms are favourite haunts where, as Kinloch remarks, they feed on the insects which infest the thick mulch of dead and decaying leaves. The notes commonly uttered are a *pink, pink*, very reminiscent of the Chaffinch as is also their flight. When alarmed, the birds usually fly up into the overhanging branches of trees where they pivot about silently, turning one way then another, and descend again to feed as soon as their suspicion is allayed.

This species has not been recorded from the Palni Hills. In Ceylon it is a common winter visitor from October to March.

[**Anthus trivialis trivialis** Linnaeus. The Tree Pipit.

Not met with by the Surveys nor apparently by any previous collectors in this area. The statement in the *Fauna* (iii, 279) that it extends south to Travancore in winter needs confirmation. The southernmost authentic record so far is from the Nilgiri Hills (*J.B.N.H.S.*, xxxvii, 96).]

Anthus hodgsoni hodgsoni Richmond. The Indian Tree Pipit.

Specimen collected: 991 ♂ 18-12-33 Pādagiri (3,000 ft.—Nelliampathy Hills).

Elsewhere not noted.

Colours of bare parts: Iris hazel brown; bill upper mandible dark horny-brown, lower pale flesh colour; gape yellow; mouth yellow and pink; legs and feet yellowish-brown; claws horny-brown.

[Additional specimens seen:
Brit. Mus. Coll.: o? -3-83 Kodāikānal (Hume Coll.); o? no date Peermade (Fry).

Measurements:

	Bill.	Wing.	Tail.
1 ♂	16	89	62.5 mm.—H. W.]

The Survey does not appear to have come across the Indian Tree Pipit in Travancore. Ferguson (*J.B.N.H.S.*, xv, 471) however, collected specimens on the High Range (in April) and at Chimunji in South Travancore in open grassland surrounded by forest at an elevation of about 4,000 ft. He only saw the bird at high elevations on the hills and never in the low country. My experience in Cochin agrees with this. The species was fairly common about Pādagiri in the Nelliampathy Hills (3,000 ft.). Single birds, small

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parties of 4 or 5, or flocks of up to 15 individuals were usually observed feeding among the fallen leaves in the tea, coffee and cardamom plantations. When disturbed they flew up into the tall *Grevillea* and other shade-trees uttering a single sharp *tseep* from time to time.

Terry (*S.F.*, x, 477) saw it frequently in March at Kodaikanal and it presumbaly has the same status in the Palni Hills as in Travancore and Cochin. It has not occurred in Ceylon.

Anthus nilghiriensis Sharpe. The Nilgiri Pipit.

Not procured by the Surveys. There are 3 specimens dated 25-29 January 1901 from Devicolum (High Range) in the Trivandrum Museum. Mr. Whistler measures these as follows:

	Bill.	Wing.	Tail.	Tarsus.
2 ♂♂	16.5-17	77.5-78.5	60-66.5	24-25 mm.
1 ♀	16	82	67.5	25 mm.

Mr. Whistler has also examined the following series from the Palni Hills in the British Museum Collection: ♀ 9-6-77 Kodaikanal 7,000 ft.; ♂♀ 30-5-77 Top of Palnis; ♂ 30-3-77 Top of Palnis; Mt. Nabu 7,000 ft.; ♂ 9-6-77 Top of Palnis, 7,000 ft. All these specimens were collected by Fairbank.

Ferguson (*J.B.N.H.S.*, xii, 203) had a specimen from Ponmudi in South Travancore. He describes this pipit as a fairly common resident on the open grass lands on the High Range (*Ibid.*, xv, 471). There is nothing recorded about it from Cochin, but its status in the hills there is doubtless the same as in the Travancore ranges and the Palnis. Terry (*S.F.*, x, 477) found it very common on the tops of all the latter and breeding everywhere. He obtained a nest with c/3 at Pittur on 5 May. The breeding season according to this observer, Davison and Betham is April and May (*J.B.N.H.S.*, xxxvii, 97).

It is not found in Ceylon.

Anthus similis similis Jerdon. The Rufous Rock Pipit.

Specimens collected: 648 ♂ 23-4-33 Balamore Estate at 3,500 ft. (Ashāmbu Hills).

Elsewhere not noted.

Colours of bare parts: Iris hazel brown; bill upper mandible dark horny brown, lower pale flesh; gape yellow; mouth pinkish yellow; legs and feet yellowish-brown; claws horny-brown.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	20.5	93.5	78	26.5 mm.

No other Travancore specimens seen.—H. W.]

As Ferguson remarks (*J.B.N.H.S.*, xv, 472) the Rufous Rock Pipit is a resident but rare bird in Travancore. He had a single specimen shot at Ponmudi (3,500 ft.) in August 1900. The Survey also came across a single pair on a grassy hilltop with outcrops of rock.

According to Hume (*S.F.*, i, 203) it occurs in the Palni and Annemalai Hills. It is not found in Ceylon.

Breeding: The testes of the specimen (23 April) measured 7×5 mm. and the birds were evidently breeding. The doubt cast in the *Fauna* (iii, 285) on Bourdillon's record of its breeding in the higher hills of Travancore therefore is scarcely justified. This doubt, however, seems only in respect of the eggs sent by Bourdillon to Stuart Baker thence, and not to the fact of breeding (*Nidification*, iii, 142).

Anthus richardi Vieillot. Richard's Pipit.

Specimens collected: 513 ♀, 514 ♂, 515 ♂ 5-4-33 Velayāni Lake, Trivandrum Environs; 576 o? 12-4-33 Cape Comorin ca. S.L., 917 ♀ 28-11-33 Wadakkāncheri 400 ft.; 1040 ♂ 30-12-33 Karūpadanna ca. S.L.

Elsewhere not noted.

Colours of bare parts: Iris brown; bill horny-brown, paler on lower

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mandible except tip; mouth pink; legs, feet and claws brownish flesh colour; soles bright chrome yellow.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂	17-19	99-100	75-78	29.5-31 mm.
2 ♀♀	17-18.5	93	72	31 mm.

The only other Travancore specimens seen are two in the Trivandrum Museum. These two specimens marked *.striolatus* (♂ 4-3-02 and ♂ 2-3-02 Trivandrum) and of Ferguson's collecting, prove to be really specimens of *A. richardi* which is not included in Ferguson's list and which the Survey has proved to be a common winter visitor to Travancore. It appears therefore that Ferguson's note on *A. striolatus* should really refer to *A. richardi*.

The late departure of this species from Ceylon and Travancore is no doubt correlated with the heavy moult in April.—H. W.]

Richard's Pipit is a winter visitor to the low country of Travancore and Cochin. It frequents swampy terrain with rank grass—typical snipe marshes—by the backwaters and irrigation tanks. Also dry, cut paddy fields in the neighbourhood of water, frequently in association with other pipits, Black-bellied Finch Larks and Skylarks. It was usually met with singly or in pairs. By the middle of April the majority of birds appeared to have left.

It has not been recorded in the Palni Hills. In Ceylon it is a winter visitor from October to May.

Anthus rufulus malayensis Eyton. The Malay Pipit.

Specimens collected: 11 ♂ 5-1-33, 43 ♂ 9-1-33, 56 ♀ 10-1-33 (at 6,000 ft.), 62 ♂ 11-1-33 Marāiyūr 3,500 ft.; 157 ♀ 25-1-33, 193 ♂ 30-1-33 Sānthanpāra (4,000-4,500 ft.); 218 ♂ 4-2-33 Thattākād 200 ft.; 326 ♂ 21-2-33 (4,000 ft.), 339 ♀ 23-2-33 (4,000 ft.), 352 ♀ 24-2-33 Peermade 3,200 ft.; 369 ♂ 27-2-33, 398 ♂ 3-3-33 Kūmili 3,000 ft.; 437 ♂ 11-3-33 Camp Derāmalāi 4,000 ft.; 516 ♂ juv. 5-4-33 Trivandrum (Velayāni Lake); 548 ♂ 9-4-33, 577 ♀ 12-4-33 Cape Comorin ca. S.L.; 656 ♂, 657 ♀ 25-4-33 Mūthūkūzhi 3,500 ft.; 770 ♀, 773 ♂ 2-8-33, 800 ♀, 802 o? 7-8-33, 851 ♂, 852 ♀, 853 ♂, 854 ♂ 14-8-33 (Golf Links) Trivandrum; 893 ♂ 24-11-33 Wadakkāncheri 400 ft.; 985 ♂, 986 o? 16-12-33 Pādagiri 4,000 ft.; 1004 ♂ 25-12-33 Karūpadanna ca. S.L.

Elsewhere noted at: Trichūr.

Colours of bare parts: Iris brown; bill upper mandible and tip of lower horny brown, rest of lower mandible pale flesh colour; gape yellow; mouth orange yellow, bright yellow or yellow and pink varying with age; legs and feet brownish-yellow; claws dusky.

[This fine Travancore-Cochin series yields the following measurements:

	Bill.	Wing.	Tail.	Tarsus.
18 ♂♂	15.5-17.5	(75.5) 79-87.5	55-62	24-26.5 mm.
9 ♀♀	15-17	75-84	54-60.5	23.5-26.5 mm.

In the Hyderabad Survey (*J.B.N.H.S.*, xxxvi, 911) and the Eastern Ghats Survey (*J.B.N.H.S.*, xxxvii, 101) I suggested both that a new race of this pipit required naming and that it was difficult to decide the identity of birds from South-West India. I have now been able to assemble about 140 specimens of this pipit from different parts of India supplementary to the good series in the British Museum, and there is now no great difficulty in understanding the position. In North-West India this pipit has the upper parts a pale rather sandy coloured brown, very similar to that of the Tawny Pipit; the lower parts are also pale being generally speaking whitish with a faint buff wash over the breast and flanks. In Ceylon it is a much more richly coloured bird. The upper parts are a rich fulvous brown, very similar to that of Richard's Pipit; the lower parts are also richly coloured being generally speaking warm buff, with the throat and centre of the abdomen whitish. There is complete intergrading between these two extremes and it is virtually impossible to draw any exact dividing line between stages in the intergrading as the effect of wear and individual variation are apt to obscure the differences. The type-locality is unfortunately Bengal, an intermediate locality from which few specimens are available.

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Ticehurst considers (*J.B.N.H.S.*, xxxii, 352) that birds from Ceylon should be separated as *malayensis* and I quite agree that birds from Ceylon and the Malay Peninsula are exactly alike. With them I am inclined to include our Travancore series. The majority of these, which are in more or less worn plumage, cannot be separated from similar worn birds in the Peninsula generally. The three freshly moulted specimens, however, agree with Ceylon birds in the greater amount and depth of buff on the lower plumage and this I cannot match with other Peninsula birds.

With common, widely distributed forms whose races intergrade, the definition of the distribution of the recognisable races has at times to be somewhat arbitrary. The very pale north-western race as described above I would recognise from the North-West Frontier Province, the Punjab and United Provinces, extending southwards over Sind and Rajputana to the Nerbudda River. For this I propose the name (in grateful acknowledgment of all the assistance I have had from a fellow ornithologist in the Punjab)

ANTHUS RUFULUS WAITEI subspecies nov.

Type: ♂ 16 February 1926, Jhelum, Punjab, H. W. Waite Collection, No. 2.

The typical race is taken as distributed over the remainder of India except for Cochin and Travancore States.

In Travancore the complete post-nuptial moult takes place mostly in August. There appears to be no spring moult, and as far as I can make out the post-juvenal moult appears to be complete.

It is interesting to note that the two birds from Cape Comorin are much paler than the others and may well belong to the typical race. The possibility that both *rufulus* and *malayensis* occur in Ceylon in different climatic zones should be borne in mind in view of Legge's remarks.—H. W.]

The Malay Pipit is an abundant resident species in both Travancore and Cochin. The Surveys found it common in the low country as well as in the hills up to at least 6,000 ft. elevation. In the former it affects ploughed and stubble fields, sparse grass-covered and stony fallow land and also the neighbourhood of the backwaters and irrigation tanks. In the hills it is found freely on the grassy slopes and summits particularly where stony, and where outcrops of sheet rock occur. Single birds, pairs or widely scattered parties of 4 or 5 were met with. Males were constantly rocketing up and soaring with a feeble 'cheeping' song, and shooting back to earth.

Specimen No. 437 was club-footed, a deformity which appeared to be either congenital or to have been contracted early in life as it in no way interfered with the normal functions of the bird. The enlarged gonads showed that it was even ready to breed.

Terry (*S.F.*, x, 478) found this Pipit common in the Palni Hills, and Fairbank (*S.F.*, v, 407) obtained specimens both at the base of the hills and 4,000 ft. up. The race *malayensis* is common in Ceylon.

Breeding: The majority of the specimens collected between November and April had enlarged gonads, and from various other signs such as birds carrying building material or food for young, it was evident that they were breeding generally throughout this protracted period. Our earliest specimen with organs in breeding condition was on 24 November; latest 25 April. The gonads of all the adult August specimens had reverted to normal non-breeding condition and the birds were in heavy post-nuptial moult.

Terry took a nest with c/3 at Pittur in the Palnis at the beginning of May.

Anthus campestris thermophilus Jerdon. Blyth's Pipit.

Specimen collected: 642 ♀ 21-4-33 Arāmboli 250 ft.

Elsewhere not discriminated?

Colours of bare parts: Mouth pinkish flesh colour, otherwise as in *A. r. malayensis*.

[The specimen measures:

Bill.	Wing.	Tail.	Tarsus.
16	90.5	damaged	26.5 mm.

For a note on this form, see *J.B.N.H.S.*, xxxvii, p. 100.—H. W.]

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This Pipit was observed in small numbers, usually singly or in widely separated pairs, in fallow fields etc. in the Arāmboli 'Gap'.

Ferguson (*J.B.N.H.S.*, xv, 472) writes under '*Anthus striolatus*' (a synonym of this bird) as follows: 'Blyth's Pipit is a winter visitor (to Travancore) and may be found in fairly large numbers in the dry paddy fields in February and March after the crops have been cut.' Mr. Whistler's remarks under *Anthus richardi* have shown that the above note refers in reality to that species.

Blyth's Pipit is a straggler to Ceylon.

Family: Alaudidæ.

Alauda gulgula australis Brooks. The Small Nilgiri Skylark.

Specimens collected: 158 ♂ 25-1-33 Sānthanpāra 4,000 ft.; 295 ♀, 296 ♂, 297 ♀ 17-2-33 Kottāyam ca. S.L.; 325 ♂ 21-2-33, 340 ♂ 23-2-33 Peermade 4,000 ft.; 440 ♀, 441 ♂ Camp Derāmalāi 4,000 ft.; 914 ♂ 27-11-33; 915 ♂, 916 ♀ 28-11-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Velayāni Lake, Trivandrum Environs.

Colours of bare parts: Iris hazel brown; bill upper mandible horny brown, lower pinkish flesh-colour; mouth pink or yellowish-pink; legs, feet and claws brownish flesh-colour.

[In the Eastern Ghats Survey (*J.B.N.H.S.*, xxxvii, 102) I referred the fine series of skylarks from the Godavery Delta to *Alauda gulgula australis* with considerable hesitation, and hoped to return to the question in the Travancore Survey. My reason for this hesitation was the smaller size of the Godavery birds compared with those from the Nilgiris and a feeling that this group required further study. I have now been into this group again—aided by this fresh series—and consider that three races are required in place of the two already recognised in continental India.

These two races are attributed in the *New Fauna* (iii, 319) to North and South India respectively. The typical race is said to occur in 'Tropical North India [whatever that means], Assam and Burma. In India south to Khandesh and roughly to a line from Hyderabad to Masulipatam.' *A. g. australis* is said to occur in India south of the typical race and in Ceylon.

The main objections to this grouping are two. Under the typical race are included the very pale birds of North-Western India and the darker birds of Bengal and other areas, while under *A. g. australis* are included the large birds of the south-western hill ranges and the smaller birds of the central and eastern plains. These anomalies are avoided by the recognition of three races.

The pale north-western race extends throughout the Punjab and the United Provinces as far east as Mogulserai and Dinapore. It is therefore necessary to restrict Franklin's rather composite type-locality in which, during the course of his journey, he might have met with both the pale and dark forms. I therefore now restrict the type-locality of *Alauda gulgula gulgula* to the Ganges between Calcutta and Benares, so that that name may continue to be used for the darker of the two birds, with which it is commonly associated.

This leaves the North-Western birds without a name and for them I propose

Alauda gulgula punjaubi subsp. nov.

This race differs from *A. g. gulgula* in its markedly paler colouration both on the upper parts and the lower parts, in fresh plumage and in worn. The pale fringes are colder in tint and the dark streaking is narrower and less intense. The buff of the lower parts does not extend from the breast to the vent but largely disappears on the abdomen. It is a slightly larger bird: Wing: 10 ♂♂ 92.5-97 mm.; 5 ♀♀ 86.5-94 mm.

Type: H. Whistler Collection, No. 598, ♂ 28 April 1912, River Sutlej, Ferozepore. Deposited in the British Museum.

A. g. gulgula extends in my opinion all down Eastern, Central and Southern India—wherever this lark occurs for it is somewhat local—to and including Ceylon where it breeds in the drier areas. To this belongs the Godavery Delta series tentatively attributed to *A. g. australis* in the Eastern Ghats Survey.

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Alauda gulgula australis differs from the typical race in its larger size, and from *A. g. punjaubi* in its darker colouration. It measures:

	Bill.	Wing.
11 ♂♂ Nilgiris	16.5-17	93.5-102 mm.
10 ♀♀ „	16-17	89.5-93 mm.

as compared with *A. g. gulgula* which measures:

	Bill.	Wing.
3 ♂♂ Bengal	16-16.5	89.5-90.5 mm.
2 ♀♀ „	14-15.5	85.5-88 mm.
24 ♂♂ Godavery Delta	14-16 (once 13)	87-93 mm.
3 ♀♀ „	13-14.5	84.5-85.5 mm.

The Survey series from the Travancore hill ranges agrees with Nilgiri birds both in colour and in measurements, though odd birds are a little darker than Nilgiri specimens. They measure:

	Bill.	Wing.	Tail.	Tarsus.
6 ♂♂	15-16	90-96	51.5-55	23.5-25 mm.
4 ♀♀	15-16.5	83.5-88	49-54	22-24 mm.—H. W.]

The Nilgiri Skylark is a common resident species in Travancore and Cochin. The Surveys found it in the low country by the backwaters, as well as up to 4,000 ft. in the hills, and it probably occurs higher. In the low country it affects cut paddy fields and was also noted in numbers on bunds and footpaths through the standing crops ready to be harvested in a fortnight or so. In the hills, the open rounded grassy summits and upper slopes as at Peermade constituted favourite haunts. As courtship was in progress everywhere, males were conspicuous soaring, fluttering in the air with legs dangling, and singing for well over 5 minutes at a stretch.

In the Palni Hills, Terry (*S.F.*, x, 478) found this Skylark common on the top of bare rocky hills. The same race *australis* occurs in Ceylon.

Breeding: All the specimens collected between 27 November and 5 April had their gonads in breeding condition. In 5 of the males the testes measured 7×5 mm. and in the sixth 6×4 mm. The ovarian follicles of all the females except one were enlarged from 1 to 3 mm. in diameter. Bourdillon in a note to Stuart Baker (*Nidification*, iii, 163) mentioned that they lay 4 to 5 eggs and later altered it to 3 to 4. According to the *Fauna* (iii, 321) the principal breeding season in South India is March to May, but many birds are said to breed again from August to November. I am unable to say anything about the second breeding period, but the birds in Travancore and Cochin certainly seem to breed uninterruptedly from November to May, and they may well be found to continue throughout the year without the break.

In the Palni Hills Terry got a nest at Pulungi and another at Pittur in April.

Calandrella brachydactyla dukhunensis (Sykes). The Rufous Short-toed Lark.

Specimen collected: 1003 ♂ 25-12-33 Karūpadanna ca. 50 ft. Elsewhere not noted.

Colours of bare parts: Iris hazel brown; bill pale horny-brown, darker on culmen and tips; legs and feet brownish flesh colour; claws darker brown.

[Measurements:

Bill.	Wing.	Tail.	Tarsus.
13	103.5	58.5	21 mm.

This is a considerable extension of the known range as this Lark has not hitherto been recorded south of North Kanara (*J.B.N.H.S.*, xi, 674).

This race appears to undergo a complete post-nuptial moult in its breeding quarters before coming down to winter in India, and then about January to March there is, in the winter quarters, a pre-nuptial moult confined to the body plumage.—H. W.]

The only locality in which the Short-toed Lark was met with by the Travancore or Cochin Surveys was Karūpadanna near the backwaters in the

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latter State. Here a flock of about fifty birds was observed on three consecutive evenings coming to roost at dusk among the scraggy grass on the open laterite plateau adjacent to the Travellers' Bungalow. The stomach and crop of the specimen were full of paddy grains gleaned from the neighbouring fields.

It has not been recorded from Ceylon.

Mirafra affinis ceylonensis subsp. nov. The Ceylon Bush Lark.

Specimens collected: 239 ♂, 240 ♂ 8-2-33 Thattākād 200 ft.; 606 ♀ 17-4-33, 641 ♂ 21-4-33 Arāmboli 250 ft.; 535 ♂, 536 ♂ 8-4-33, 553 ♂ 10-4-33 Cape Comorin ca. S.L.; 735 ♂ 26-7-33 (Kūttāni 300 ft.); 756 ♂ 31-7-33 (Akkūlam 150 ft.); 771 ♂, 772 ♂ 2-8-33, 801 ♀ 7-8-33 (Golf Links); 823 ♂ 10-8-33 (Kūttani 300 ft.); 855 ♂ 14-8-33 (Golf Links) Trivandrum Environs; 911 ♂ 27-11-33; 942 o? 5-12-33 Nemmāra 300 ft.; 1014 ♂ 26-12-33 Karūpadanna ca. S.L.

Elsewhere not noted.

Colours of bare parts: Iris hazel brown or brownish-straw; bill horny-brown, paler (flesh-coloured) at gape and base of lower mandible; mouth pink; legs, feet and claws brownish flesh-colour.

[Additional specimen seen:

Brit. Mus. Coll.: ♂ 7-6-97 Periakulam, eastern base of Palnis (Fairbank).

When writing the Eastern Ghats Survey Report I was not able to see a satisfactory series of these larks from Travancore and Ceylon, but that deficiency has now been remedied by the admirable series collected in Travancore by Mr. Sálim Ali and by the loan of a series from the Colombo Museum. These confirm my original opinion that Travancore and Ceylon birds are slightly darker and have larger bills than birds from the eastern side of India. Colour is not a very good character as this species bleaches so markedly and apparently so quickly that there is much variation in any series, but the difference in size in the beak cannot be overlooked, especially as a large beak is the racial characteristic of several Cingbalese forms.

This character is shown by the following measurements:

	Bill.	Wing.	Tail.
11 ♂♂ Ceylon	16-18.5	79.5-90	43-50.5 mm.
3 ♀♀ Ceylon	16.5-17.5	81-82.5	— mm.
15 ♂♂ Travancore	16-18	79.5-89	42-52.5 mm.
2 ♀♀ Travancore	15-16.5	78	39-41 mm.
26 ♂♂ E. Ghat Survey	14.5-17.5	77-88	43-50 mm.
13 ♀♀ E. Ghat Survey	13-17	75-82	38.5-45 mm.

The significance of these figures—and the comparative size of beaks is admittedly difficult to appreciate from measurements—is more evident when I state that out of the 31 Ceylon and Travancore specimens all but 8 measure 17 mm. and upwards, whereas in the 39 Eastern Ghat specimens all but 2 measure under 17 mm. I am of opinion that this difference must be recognised and accordingly propose for Ceylon and Travancore birds the name

MIRAFRA AFFINIS CEYLONENSIS subsp. nov.

Type: ♂ dated 7-11-1877, Colombo, Ceylon. Collected by Messrs. Hart Bros. (British Museum Collection).

It seems probable that this form will be found to occur as far north as North Kanara. I have seen no further evidence as yet to settle the question of the specific identity or otherwise of *Mirafra affinis* and *M. erythroptera*.

The post-juvenal moult is complete. There is no pre-nuptial moult. The post-nuptial moult begins with the body plumage and tertiaries, then spreads to the wing quills and finally to the tail, the tail beginning sometimes after the body and wing moult is nearly finished. This order is also, apparently, observed in the post-juvenal moult.—H. W.]

The Ceylon Bush-Lark is a common and resident species in the low country of both Travancore and Cochin. The Surveys never met with it above 500 ft. elevation. It inhabits open cultivation, sparse scrub-and-bush country, fallow land and grassy hummocks with outcrops of sheet rock. The males have a habit of springing up into the air every now and then for about 20 ft. or so,

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uttering a feeble, mousy song *swīr, swīr swīr,* etc., of the volume and quality of a Purple Sunbird's notes, and parachuting down in spirals—wings outstretched and motionless, legs dangling—to perch on a bush-top or clod.

In the hand the bills of the specimens at once struck me as enormous as compared with those obtained in the Hyderābād State.

It has been obtained on the eastern (dry) base of the Palni Hills in June (*S.F.*, v, 408—specimen in British Museum) and is found in Ceylon, presumably in similar facies.

Breeding: No satisfactory data as regards breeding was obtained by the Surveys though several of the specimens collected between 27 November and 10 April as well as in the first half of August showed a slight departure in their gonads (3×2 to 5×2 mm. in males) from the normal non-breeding condition. The earlier specimens, however, from their comparatively fresh plumage suggested that their gonads were developing, while all the August specimens were undergoing more or less heavy post-nuptial moult indicative of having finished breeding. This would point to the breeding season being April, May, June and possibly July, but it is not inconceivable that, as is said to be the case in Ceylon, this Bush-Lark may breed throughout the year, relays of birds presumably becoming sexually mature at different times.

Ferguson (*J.B.N.H.S.*, xv, 472) found a nest containing a single egg in the Public Gardens, Trivandrum, on 26 April 1902. According to *Nidification* (iii, 174) Bourdillon and Stewart took eggs in Travancore in March, April and May.

Galerida malabarica Scopoli. The Malabar Crested Lark.

Not procured by the Surveys. Possibly confused with *Alauda*? Mr. Whistler has examined four specimens in the Trivandrum Museum labelled as follows: ♂♂ 19-6-02, ♂ 20-6-02 Quilon; ♂ 7 June (?) Muttam (?). He does not record measurements from doubt of the sexing. There are also three Anjango specimens in the British Museum Collection.

Ferguson (*J.B.N.H.S.*, xv, 472) only observed and collected this Lark on the High Range at 6,000 ft. elevation, where according to him it was fairly abundant and going about usually in small flocks.

It has not been recorded in the Palni Hills and it does not occur in Ceylon.

Eremopterix grisea grisea (Scopoli). The Ashy-crowned or Black-bellied Finch-Lark.

Specimens collected: 522 ♂ 7-4-33; 552 nestling (in alcohol) 9-4-33 Cape Comorin ca. S.L.; 679 ♂ 16-7-33, 733 ♀ 27-7-33 Beach, Trivandrum; 912 ♂ 27-11-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Marāiyūr (3,000 ft.); Ārāmboli (250 ft.); Nemmāra (300 ft.); Karūpadanna (ca. S.L.).

Colours of bare parts: *Adult*: Iris brown; bill greyish-white, dusky on culmen; mouth pink; legs, feet and claws brownish flesh-colour. *Nestling* (No. 552): Gape and mouth bright orange; a black point each at tip of upper and lower mandible; a black point at tip of tongue and one each on either side of base of tongue.

[No. 679 has the bill 14 mm. which is without parallel in the very large number of Indian and Cinghalese birds which I have measured. It must be abnormal. Excluding this, the series measures:

	Bill.	Wing.	Tail.
3 ♂♂	12-12.5	76.5-79	39.5-45 mm.
1 ♀	13	76	moult.—H. W.]

The Ashy-crowned Finch-Lark is common and resident in the drier portions of the low country in Travancore and Cochin. To some extent it may be locally migratory. Ferguson says (*J.B.N.H.S.*, xv, 473) that at Cape Comorin it is fairly common throughout the year. 'In the dry weather it frequents the paddy fields about Trivandrum, but disappears when the rains come on.' Mr. Pillai, however, obtained specimens on the Trivandrum Beach in July.

It affects dry stubble fields, fallow land and laterite country in the neighbourhood of cultivation, and is also partial to the sparse grass-covered sandy

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stretches by the sea in South Travancore. A single pair was observed in dry, terraced paddy fields in the valley at Marāiyūr (3,000 ft.) a locality rather remarkable for its combination of hills and plains features both wet and dry.

Flocks collected every evening to roost on the ground on the scraggy grass-covered laterite plateau adjoining the Travellers' Bungalow at Karūpadanna. With the aid of an electric torch it was revealed that the birds do not sleep huddled together, but squat individually a foot or two apart.

This Finch-Lark is presumably common about the eastern (dry) base of the Palni Hills, and Fairbank (*S.F.*, v, 408) obtained a specimen at Periakulam. In Ceylon it is replaced by the large-billed race *E. g. ceylonensis* Whistler.

Breeding: Specimen No. 912 (27 November) had testes enlarged to 7×5 mm. and it was obviously breeding. This also appeared to be the case with No. 522 (7 April—testes 6×4 mm.) which was in fresh plumage and had an incubation patch. No. 552 (9 April)—a downy chick—was taken from a nest containing a second nestling in the same stage. The nest was a shallow depression sparsely lined with grasses, under shelter of a clod on fallow land. During the whole of the Survey period—November to May—males were observed in their courtship aërobatics and chasing off rivals or intruders. Nesting operations, however, probably extend over most months of the year in this area.

Family: Zosteropidæ.

Zosterops palpebrosa nilgiriensis Ticehurst. The Nilgiri White-eye.

Specimens collected: 91 ♀ 14-1-33 Marāiyūr 3,500 ft.; 130 ♂, 131 ♀ 23-1-33 Sānthanpāra 3,500 ft.; 980 ♀ 14-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Mūnnār (5,000 ft.); Peermade (3,200 ft.); Camp Derāmalāi (3,000 ft.—Panthalam Hills); Balamore Estate (2,000-4,000 ft. Ashāmbu Hills).

Colours of bare parts: Iris buffy hazel brown; bill horny-brown, grey at gape and chin; legs and feet slaty-grey; claws brown.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	13.5	56.5	39	16.5 mm.
3 ♀♀	14-15	53-56	38-41	16-16.5 mm.

These four specimens confirm the fact that *nilgiriensis* is a good race. In colour they are much darker more saturated above, while the flanks and sides of the breast are washed more heavily with grey than in either the typical race or *Z. p. occidentis*.

It is interesting to note that the two specimens shot on 23-1-33 are in moult, both finishing their body moult and beginning the tail moult. This is presumably the post-nuptial moult as in a large series of *Z. p. occidentis* I find that there is no pre-nuptial moult and the post-nuptial moult takes place from July to November.—H. W.]

Ferguson (*J.B.N.H.S.*, xv, 263) correctly describes the White-eye as confined to the hills in Travancore, and his description applies to its status in Cochin as well. The Surveys nowhere came across this species below 1,500 ft. and the highest elevation at which it was met was 7,500 ft.

It is a resident, and not uncommon is suitable facies. It frequents evergreen sholas, moving about restlessly in flocks which systematically search the foliage for insects, both in bushes as well as up in the tree-tops. They are also commonly observed springing open and probing with their bills into *Loranthus* flowers for the nectar, and the birds must play an important part in cross-pollinating them as I have found by a microscopic examination of the pollen adhering to their chin and forehead. *Erythrina* shade trees in tea, coffee and cardamom plantations when in bloom are also regularly visited for the nectar and derive similar benefit. The flocks often form part of the localised bird associations in forest. I have noted in the field that some of the jingling notes which the birds constantly keep up are curiously reminiscent of the laugh of the woodpecker *Chrysocolaptes guttacristatus*—of course in miniature.

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From what Terry writes (*S.F.*, x, 478) the White-eye is apparently common on the Palni Hills. It is represented in Ceylon by the race *Z. p. egregia* and also by a very closely allied species *Z. ceylonensis* which is confined to the hills over about 3,000 ft.

Breeding: The male shot on 23 January (No. 130) had testes enlarged to 5×4 mm. It was in moult, however, which Mr. Whistler presumes was post-nuptial (cf. supra) meaning therefore that the bird had lately finished breeding (?). The gonads of the other three specimens were undeveloped and no other direct evidence in this regard was obtained by the Surveys. According to Ferguson, the breeding season in Travancore is April and May. That the birds also breed later on in the year—in December or January—is suggested by the above specimen.

Terry found a nest with young at Kukal in the Palni Hills in May.

Family: Nectarinidæ.

[**Æthopyga siparaja vigorsi** (Sykes). Vigor's Yellow-backed Sunbird.

Nidification (iii, 205) after giving the distribution of this Sunbird as extending from Bombay and Poona to the south of Travancore, states: 'As Stewart found three young in a nest on 8 June, it would appear that the breeding season (in Travancore) starts in the middle of May and continues up to the end of September.'

Neither the Surveys nor any of the other observers in Travancore, Cochin, Palni Hills or in the immediately neighbouring areas record meeting this species, and therefore the temptation is irresistible to accept the verdict of the Eastern Ghats Report (*J.B.N.H.S.*, xxxvii, 282) that the distribution in the *Fauna* (iii, 382) as well as *Nidification* is inaccurate. One would very much like to have further particulars of the nest alleged to have been found by Stewart and also to learn whether the nestlings or their parents have been preserved and confirm his identification.]

Cinnyris lotenia (Linnaeus). Loten's Sunbird.

Specimens collected: 70 ♂ 12-1-33 Marāiyūr 3,500 ft.; 694 ♀ 20-7-33 (Thirūmalāi 120 ft.); 717 ♂ 24-7-33 (Marūthānkūzhi 50 ft.); 816 ♂ 9-8-33 (Nettayam 200 ft.); 835 ♂ 11-8-33 (Pūlayanārkotta 200 ft.) Trivandrum Environs.

Elsewhere noted at: Thattākād. Other sight records not given owing to possible confusion with *C. asiatica*.

Colours of bare parts: Iris brown or reddish-brown; bill, legs, feet and claws horny-black; mouth pinkish-brown.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂	27-28.5	56.5-58.5	36-39	15-15.5 mm.
1 ♀	28.5	55.5	34.5	14.5 mm.

Additional specimen examined:

Brit. Mus. Coll.: ♂ ad. 5-6-77 eastern base of Palnis (Fairbank).

This Sunbird has no eclipse plumage. The juvenile male is exactly like the adult female and can only be distinguished by the shorter bill (25 mm.) and softer feathers. There is a complete post-juvenal moult to adult dress (*vide* Ticehurst, *Ibis*. 1935, p. 195).—H. W.]

Loten's Sunbird is a fairly common resident species in the low country of Travancore and presumably also in Cochin whence, however, the Survey unfortunately procured no specimens or undoubted sight records. According to Ferguson (*J.B.N.H.S.*, xv, 473) it ascends the hills to 2,000 ft.

Sunbirds in Travancore and Cochin were invariably noted as the most regular visitors to *Loranthus* clumps in flower, moving about restlessly among the clusters of buds, squeezing their tips to spring them open, probing into the flower tubes for nectar with their perfectly adapted bills and assisting in their cross-fertilisation by transferring the pollen adhering to their forehead, throat or bill on to the mature stigmas of other blossoms. Numerous other

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species of flowers are also visited, *Lantana, Erythrina* and *Bombax* being amongst the commonest.

We have no definite information concerning the status of this species in the Palni Hills, but it would appear that it does not ascend them to any height. Fairbank (*S.F.*, v, 399) obtained a male at their eastern base and did not see another during his stay (up). It is found in Ceylon where it is said to ascend the hills up to 3,000 ft.

Breeding: The testes of No. 70 (12 January) were enlarged to 5×4 mm. It was in perfect metallic plumage. The testes of No. 717 (24 July) measured 7×6 mm. and those of 835 (11 August) 6×4 mm. The ovarian follicles of 694 (20 July) were enlarged. All these specimens were likewise in fresh plumage and manifestly breeding. According to Stewart and Bourdillon (*Nidification*, iii, 214), this Sunbird breeds in Travancore principally from January to April and on into May. The evidence we have procured is somewhat confusing in view of that statement, but it certainly suggests that as in many other Travancore species the breeding season is not well-defined and probably extends over a protracted period.

Cinnyris asiatica asiatica (Latham). The Indian Purple Sunbird.

Specimens collected: 403 ♂ 5-3-33 Kūmili 3,000 ft.; 592 ♂ 13-4-33 Cape Comorin ca. S.L.; 896 ♂ 24-11-33 Wadakkāncheri 400 ft.; 989 ♂ 16-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Munro Island (Vembanād Lake, Kottāyam Backwaters); Rājampāra (1,350 ft.); Trivandrum; Nemmāra (300 ft.). In these sight records, the possible confusion with *C. lotenia* must be borne in mind.

Colours of bare parts: Iris brown or orange-brown; bill, legs, feet and claws brownish-black; mouth brownish-pink or slaty-pink.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂	19.5-21	55-58	33-35.5	14.5-15.5 mm

Additional specimen seen: *Brit. Mus. Coll.*: ♂ 15-1-75 Kalland Kharmi (?) South Travancore (Bourdillon).

The adult male moults by a complete post-nuptial moult from the metallic plumage into the eclipse in late June and July and moults back again to full plumage about November. In eclipse the broad black line from the throat to the breast, with its metallic gloss, the black wings with their metallic coverts and the metallic wash on the tail easily distinguish this plumage from that of the female.

The immature male and female are alike and similar to the adult female plumage, but I am not quite sure when the metallic plumage is first assumed by the male.—H. W.]

Like the last, the Purple Sunbird is also a fairly common resident species in the Travancore-Cochin area. I have no record of its occurring above 3,000 ft., but it was not uncommon about that elevation. At Kūmili and in the neighbourhood of the Periyār Lake it was constantly observed probing for nectar into the blossoms of *Gmelina arborea*, a common tree in deciduous forest there and flowering generally in March. It also frequents gardens and compounds in villages and towns, both large and small.

According to Fairbank (*S.F.*, v, 399) it is common at the base of the Palni Hills. It is a resident in Ceylon.

Breeding: No. 896 (24 November) was in fresh metallic breeding dress with testes enlarged to 5×3 mm. In No. 403 (5 March) in like plumage the testes measured 6×4 mm. The other two males (16 December and 13 March) were in intermediate plumage with undeveloped gonads. T. F. Bourdillon (*J.B.N.H.S.*, xv, 473) describes eggs taken in Travancore but is silent as regards the breeding season there. From the evidence provided by the Survey specimens it appears that breeding commences, at least, by the latter half of November, but how long it continues is not known.

Cinnyris minima (Sykes). The Small Sunbird.

Specimens collected: 206 ♂, 207 ♀ 3-2-33 Thattākād 200 ft.

Elsewhere noted at: Marāiyūr (at 7,000 ft.); Sānthanpāra (3,500 ft.);

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Urumbikera Reserve Forest, near Mundakāyam (ca. 1,000 ft.); Peermade (3,200 ft.); Kumili (ca. 3,000 ft.); Balamore Estate (2,000 ft.—Ashambu Hills); Kuvallé Incline, Cochin Forest Tramway; Padagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris brown; bill, legs, feet and claws in male blackish-brown, in female somewhat paler. Mouth (in female only) yellowish near gape otherwise greyish-pink.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	15.5	49	30	13 mm.
1 ♀	14.5	45	27	— mm.

Additional specimens seen:

Brit. Mus. Coll.: ♂ 18-5-77 Painkad 4,000 ft., Lower Palnis (Fairbank); ♀ 15-6-77 Tandagudi 4,000 ft., Lower Palnis (Fairbank); ♂ no data, ♂ 13-1-76 Mynall, Travancore (Bourdillon).

The male has an eclipse plumage in which it becomes like the female except that the metallic colours are retained on the lower back, rump and upper tail coverts. This is assumed about April or early May and is retained through June, the moult to the full metallic plumage taking place again before August. The young male and female are alike and similar to the adult female, though rather yellower below. The young male attains the metallic adult plumage by a complete moult about May.—H. W.]

The Small Sunbird is common in the hills of Travancore and Cochin. Thattākād (200 ft.) at the foot of the High Range is the lowest elevation at which the Surveys came across it, the highest being Kūmarikkāi Malāi 7,000 ft. (above Marāiyūr). Here the birds were met with on the outskirts of a small shola. This Sunbird prefers well-wooded country and generally speaking is inseparable from evergreen forest or its close proximity. I did not observe it at all anywhere near the backwaters or in the low plains country about the coast. Mr. K. K. Nayar, Professor of Zoology, Maharaja's College, Ernakulam, has, however, recently recorded it (*J.B.N.H.S.*, xxxvii, 730-32) breeding at Ernakulam. Unfortunately he did not collect a specimen, but in reply to my doubts assures me of the correctness of his identification. This record, if authentic, must undoubtedly be considered a very exceptional one.

I found the Small Sunbird very partial to the blossoms of *Erythrina lithosperma* shade trees in tea and coffee plantations and it was of course invariably present on *Loranthus* clumps in flower. At Balamore Estate the flowers of *Duranta plumieri* planted as a hedge along the path from the tea factory to the Travellers' Bungalow attracted numbers of these sunbirds.

The courtship song of the male consists of a feeble, squeaky *see-swee, see-swee, see-swee* etc. uttered from a branch in the proximity of the female, to the accompaniment of a restless pivoting this way and that the while.

In the Palni Hills, Fairbank (*S.F.*, v, 398) found this species common from 4,000 ft. elevation to the top of the hills. It is locally distributed in Ceylon.

Breeding: On 12 December (Nelliampathy Hills, Cochin) a female was observed carrying a strip of fibre in her bill. She was escorted by the male who was singing. Most males at this time were noted as being in fresh breeding dress. The specimens (3 February) appeared to be breeding or about to breed. The testes of the male measured 5×4 mm., the ovarian follicles of the female being about 1 mm. in diameter. The former was in fresh breeding plumage, and the latter just completing pre-nuptial moult.

According to Ferguson, the breeding months in Travancore are December and January. *Nidification* (iii, 225) gives the breeding season in Ceylon and Travancore as February, March and April, and in Kanara as December to April.

Cinnyris zeylonica (Linnaeus). The Purple-rumped Sunbird.

Specimens collected: 100 ♂ 15-1-33 Marāiyūr 3,500 ft.; 591 [♀] 13-4-33 Cape Comorin ca. S.L.; 693 ♀ 20-7-33 (Thirumalai 120 ft.); 746 ♂ 29-7-33 (Kuttāni 300 ft.); 778 ♂ 2-8-33 (Kovālam ca. 70 ft.); 792 ♀ 5-8-33 (Poojappūra 140 ft.); 814 ♀, 819 ♀ 9-8-33 (Nettāyam 200 ft.); 844 ♂ 13-8-33 (Veli) Trivandrum Environs; 957 o? 8-12-33 Nemmāra 300 ft.

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Elsewhere noted at: Thattākād (200 ft.); Kottāyam (ca. S.L.); Arāmboli (250 ft.); Chālakūdi; Trichūr; Karūpadanna (ca. S.L.).

Colours of bare parts: Iris orange-brown or reddish-brown; bill, legs, feet and claws horny-black; mouth brownish-pink (in some, yellowish pink).

[Measurements:

	Bill.	Wing.	Tail.
5 ♂♂	17-18	55.5-56.5	33.5-36 mm.
6 ♀♀	16-17	51-54.5	30-31.5 mm.

Additional specimens seen:

Brit. Mus. Coll.: ♀ 25-2-80 Quilon (Bourdillon); ♀ juv. 6-6-77 Periakulam, Palnis (Terry).

B.N.H.S. Coll.: ♂ 27-8-93 Thekadi (Cook).

This species has no eclipse plumage. The post-juvenal moult is complete and the young male goes straight into the metallic plumage. The juvenile male and female are alike and closely resemble the adult female in fresh plumage when the upper parts are greenish olive with the chin and throat pale yellow. In worn plumage the upper parts of the female fade to earthy-brown. The female of *zeylonica* may be distinguished from the female of *asiatica* by

(1) shorter bill;

(2) chin and throat and flanks are white, or in fresh plumage the chin and throat are white with a yellowish wash, contrasting with the yellow of the abdomen;

(3) golden olive edges to the wing quills.—H. W.]

The Purple-rumped Sunbird is a common resident species in Travancore and Cochin. Except at Marāiyūr—a locality peculiar in its mingling of hills and plains forms—it was met with only in the low country, and up to not more than about 300 ft. elevation. Ferguson (*J.B.N.H.S.*, xv, 474) also saw it in the low country in Travancore and never on the hills. The general impression conveyed by the *Fauna* (iii, 408) that it ascends the Palnis up to 2,500 ft. and is found up to 3,000 ft. in Travancore therefore needs modification. It has, moreover, a decided predilection for dry and deciduous country, a fact which was clearly evident in the case of Thattākād. Along the old High Range road in this locality where heavy evergreen forest occurs, only *Cinnyris minima* was met with, whereas a few miles down the Periyār River below the Travellers' Bungalow where open deciduous secondary jungle occurred, the Purple-rumped Sunbird completely replaced it.

It has the usual sunbird habits. Nectar of *Calycopteris floribunda*, *Lantana camara*, *Loranthus* (*loniceroides* ?) and *Moringa oleifera* is largely eaten, and in the gardens the exotic *Russelia juncea* is an unfailing attraction to the birds.

It apparently does not ascend the Palni Hills. Fairbank (*S.F.*, v, 398) obtained a pair at the eastern (dry) base of the hills and observed a few others there, but thought they were probably more abundant around gardens in the plain. It is a resident in Ceylon.

Kinloch writing of the Nelliampathy Hills (*J.B.N.H.S.*, xxvii) says: 'I believe this (Purple-rumped) to be our only sunbird. Very common.' Kinloch's list, however, altogether omits the Small Sunbird, a species which I found to be common about Pādagiri to the exclusion of others. To my mind there is no doubt that this is a case of mistaken identity and that his note in reality relates to *C. minima*.

Breeding: On 23 December a nest was discovered hanging about 4 ft. up in a potted croton within 4 yds. of the Residency Palace at Trichūr. Motor cars constantly drove past or stopped within arm's length of it, and malis sprayed water on the crotons twice a day. The nest was the usual rounded pear of fibres with pieces of bark and caterpillar droppings on the outside. It contained c/2 which the female was brooding complacently. Another similar nest was observed at Karūpadanna on 28 December, suspended from the tip of a *Pandanus* leaf arching over a constantly used foot-path on the edge of paddy fields. The male was in the proximity, the hen within.

The testes of the July-August males were enlarged from 4×3 mm. to 5×4 mm. and the ovarian follicles of the females from 1 to 4 mm. in diameter. They were all in fresh plumage at the time, and some at least undoubtedly breeding.

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Ferguson says that in Travancore they breed in February and March. *Nidification* (iii, 227) gives the breeding season as February to April while the evidence now procured by the Surveys suggests that the season is by no means so short or so well-defined.

Arachnothera longirostra longirostra (Latham). The Little Spider-hunter.

Specimens collected: 125 ♂ 22-1-33, 133 ♂ imm. 23-1-33, 143 ♀ imm. 24-1-33 Sānthanpāra 3,500 ft.; 472 ♂ 19-3-33 Rājampāra 1,350 ft.; 988 ♂ 16-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Thattākād (200 ft.); Ūrūmbikera Reserve Forest (ca. 1,000 ft.—near Mūndakāyam); Peermade (3,200 ft.); Kūmili (3,000 ft.); Camp Derāmalāi (3,000 ft.); Balamore Estate (2,000 ft.—Ashāmbu Hills); Kuvallé Incline—Cochin Forest Tramway; Kūriārkūtti (1,600 ft.—Annemalāi Hills).

Colours of bare parts: Iris brown; bill horny-brown, plumbeous at chin and on gonys; mouth greyish-pink with brown mottling; legs, feet and claws bluish-plumbeous. In 143 (♀ imm.) legs greyish-blue, feet parti-coloured yellow and blue.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂	34-36.5	64-66.5	40-41	15 mm.
1 ♀	32.5	59	36.5	14.5 mm.

Additional specimens examined:

Brit. Mus. Coll.: ♂ 16-6-77 Periur woods 4,000 ft., Lower Palnis (Fairbank); ♀ 17-6-77 Pundegude 1,000 ft., Lower Palnis (Fairbank); ♂ juv. 9-2-80, ♀ 24-11-77 Mynall (Bourdillon); ♂ 5-4-79 Eridge, Travancore (Bourdillon).

H. Whistler Coll.: o? 23-10-23 Nelliampathies (Kinloch).

The immature male and female are exactly alike and cannot be distinguished from adults.—H. W.]

The Spider Hunter is a typical dweller of evergreen forests, and in this biotope it is found fairly commonly in Travancore and Cochin, both in the low and foothills country as well as in the hills—in our experience—up to at least 4,000 ft. Ferguson (*J.B.N.H.S.*, xv, 474) met with it to upwards of 5,000 ft. in the High Range. Cardamom sholas with their lofty shade trees are favourite haunts, and Banana plantations adjoining forest homesteads or estate cooly lines almost invariably hold their quota. The birds usually go about in pairs, and often two or more of these may be seen feeding gregariously. In addition to spiders and other insects, their food was found to consist largely of the nectar of flowers into which they probe with their admirably adapted bills and which they undoubtedly help to fertilise. Some of the blossoms observed in regular attendance were those of *Musa* (*sapientum* ?), *Erythrina lithosperma*, *Mezoneuron cucullatum* and *Sterculia colorata*.

Its harsh calls—*chee-chee*—are very like those of the Paradise Flycatcher (*Tchitrea*) or the Ashy Swallow-Shrike (*Artamus*) but somewhat pleasanter and in a higher key. The song consists of a metallic *which-which-which-which* etc. repeated about once or twice a second without any variation, and is kept up for two minutes or more at a stretch. The volume of sound is somewhat bigger than that of the Purple Sunbird (*Cinnyris asiatica*).

Fairbank (*S.F.*, v, 397) obtained a specimen at Periur (4,000 ft.) in the Palni Hills and its status there is presumably the same as in Travancore and Cochin. Curiously enough it does not occur in Ceylon.

Breeding: Between December and March at least the breeding season was certainly in progress. Specimen No. 988 (16 December) had its testes enlarged to 10×5 mm. It was in fresh plumage and singing excitedly. In No. 125 (22 January) the testes measured 6×4 mm. and in 472 (19 March) 4×3 mm. From the fresh plumage of these specimens moreover, and from the general behaviour of the birds at the time—singing and chasing each other etc.—it was clear that they were breeding or about to breed. Nos. 133 (23 January) and 143 (24 January) were immature with imperfectly ossified skulls, indicating that they had hatched a month or two before. The season is apparently a protracted one. According to *Nidification* (iii, 235) Stewart and Bourdillon took eggs in Travancore from 7 March up till the end of May.

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Family: Dicaeidæ.

Dicæum concolor concolor Jerdon. The Nilgiri Flower-pecker.

Specimens collected: 171 ♂ 28-1-33 Sānthanpāra 3,500 ft.; 290 ♂ 16-2-33 Kottāyam ca. 100 ft.; 442 ♂ 16-3-33 Rājampāra 1,350 ft.

Elsewhere noted at: Thattākād (200 ft.); Kūmili and Periyār Lake Environs (3,000 ft.); Tenmalāi (500 ft.); Trivandrum; Balamore Estate (2,000 ft.—Ashāmbu Hills); Kūriārkūtti (1,600 ft.); Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris brown; bill bluish-grey, dark horny-brown on culmen; mouth grey, brownish and pink; legs, feet and claws brownish-black.

[Additional specimens seen:

Brit. Mus. Coll.: ♂ 23-6-77, ♀♀ 31-5-77 Kodaikanal 7,000 ft., Palni Hills (Fairbank); ♀ 1-8-00 Ponmudi, Travancore (Ferguson).

Sparrow Coll.: ♂ juv. 14-3-14 Cardamom Hills.

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
3 ♂♂	12.5-13	48-50.5	23.5-25.5	12.5 mm.
1 ♀	12	47	—	— mm.

The juvenile is similar to the adult in plumage. No. 290 *might* be *D. erythrorhynchos*. It has the beak of the latter and the colour of the former.—H. W.]

The Nilgiri Flowerpecker is a common resident species in the Travancore-Cochin area. It frequents deciduous as well as mixed deciduous-and-evergreen forest, as also clearings in and about plantations, and groves of trees in the vicinity of villages. The Surveys came across it from the low country up to about 4,000 ft. elevation, but it has a decided preference for the foothills country and the hills up to 2,500 ft. It was invariably observed on *Loranthus* clumps, and indeed the presence of the plant parasite in any locality was the surest indication of the presence of Flowerpeckers. These birds feed largely on the nectar of the flowers and on its ripe berries, and constitute perhaps the most important agency in the fertilisation of its blossoms and the dissemination of its seed. Mango and Nelli trees (*Phyllanthus emblica*) were universally parasitized by *Loranthus longiflorus* Desr. and other species, who have, in addition, a large number of hosts besides. At Nemmāra, teak trees in the Government forest were heavily infested.

I found the voice and notes of this species indistinguishable from those of Tickell's Flowerpecker.

It is common in the Palni Hills. Fairbank (*S.F.*, v, 399) obtained specimens at Kodaikanal, 7,000 ft. It does not extend to Ceylon.

Breeding: The testes of two of the specimens namely No. 171 (28 January) and 290 (16 February) measured 3×2 mm. and appeared to be maturing. The latter was completing pre-nuptial moult on the secondaries and rectrices. In the specimen collected on 16 March the organs were in a quiescent state. No other evidence as regards breeding was obtained by the Surveys. Col. Sparrow collected a juvenile in the Cardamom Hills on 14 March (1914). According to Stewart and Bourdillon, the normal breeding months in Travancore are March to May (*Nidification*, iii, 243).

Dicæum erythrorhynchos erythrorhynchos (Latham). Tickell's Flowerpecker.

Specimens collected: 590 ♂ 13-4-33 Cape Comorin ca. S.L.; 689 ♀ 18-7-33 (Pūlayanārkotta 200 ft.); 707 ♀ 22-7-33 (Pattom 50 ft.); 786 o? 4-8-33 (Cattle Farm); 842 ♂ 12-8-33 (Beach) Trivandrum Town and Environs; 938 ♀ 4-12-33 Nemmāra 300 ft.; 1048 ♀ juv. 31-12-33 Karūpadanna ca. S.L.

Elsewhere noted at: Kottāyam (ca. S.L.); Peermade (3,200 ft.)—both doubtful with *concolor;* Kūriārkūtti (1,600 ft.); Wadakkāncheri (400 ft.); Pādagiri (3,000 ft.); Trichūr; Cranganour Fort.

Colours of bare parts: *Adult*: Iris hazel brown; bill pale horny brown, pinkish flesh-colour at gape and on lower mandible excepting tip; mouth pale pink; legs, feet and claws dark slate. *Juvenile* (1048): Iris hazel brown;

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bill orange-yellow, dusky on upper mandible and tips; gape and mouth orange-yellow; legs and feet slate; claws horny-brown.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
2 ♂♂	12	49-52	23.5-25	12.5 mm.
4 ♀♀	13	48.5-50	23.5-24.5	— mm.

Additional specimens seen:

Brit. Mus. Coll.: ♂ 23-3-76 Palnis (Fairbank); ♂ 5-6-77 Periakulam, eastern base of Palnis (Fairbank); ♀ 14-5-94 Ponmudi 3,500 ft.—Travancore (Nair).

The juvenile is similar to the adult in plumage.—H. W.]

Tickell's Flowerpecker is a common resident species in the low country of Travancore and Cochin. The Surveys' sight records from the hills, being unsupported by specimens, must be accepted with some reserve considering how easy it is to confuse this with the foregoing species in the field. Indeed, it is not always a simple matter to tell the one from the other even in the hand (*vide* Specimen No. 290 under *concolor*). On the whole, however, my impression is that as a general rule Tickell's Flowerpecker is not met with in the higher hills, although of course both do at times occur in the same localities lower down. It is inseparable from *Loranthus* whose flowers it probes into for nectar and cross-fertilises, and whose seed it disperses. *Viscum* clumps are similarly attended and the guts of a specimen shot off one of these contained no less than 27 of the viscous seeds, each measuring ca. 3×2 mm., and some on the point of being extruded from the vent.

In the Palni Hills, according to Fairbank (*S.F.*, v, 399) it is sometimes observed on the hillsides, but is common in the adjacent plains. In Ceylon it is represented by an endemic race—*ceylonensis*—which is much darker-coloured above.

Breeding: Specimen No. 1048 (31 December) was a juvenile lately out of nest and still attended and being fed by its parents. Three of the specimens collected by Pillai (18 July and 4 August) were immature with imperfectly ossified skulls. The gonads in the rest of the specimens were in non-breeding condition.

Ferguson (*J.B.N.H.S.*, xv, 474) had a nest from Trivandrum brought to him on 16 March containing two young birds and one 'fresh' egg! The breeding season in this area appears to be ill-defined and an extended one. The *Fauna* (iii, 432) gives the general season as February to June, but says that they often have two broods in the year.

Piprisoma agile agile (Tickell). The Thick-billed Flowerpecker.

Specimen collected: 1 ♂ 4-1-33 Marāiyūr 3,500 ft.

Elsewhere noted at: Peermade (3,200 ft.); Nemmāra (300 ft.—base of Cochin Nelliampathies).

Colours of bare parts: Iris brownish-orange; bill plumbeous, darker on culmen; mouth pinkish-brown; tongue yellow; legs and feet slaty-brown.

[The specimen measures: Bill 10, wing 62, tail 31.5, tarsus 13.5 mm.

This is a new record for the Travancore list, the bird not having been recorded previously in India south of the Nilgiris though it has a local distribution in Ceylon.—H. W.]

The Thick-billed Flowerpecker is a rather uncommon and locally distributed species in our area. It has not been recorded by previous observers in Travancore, Cochin or the Palni Hills. It was noted as fairly common (not abundant) in and about deciduous forest and in the neighbourhood of cultivation in the localities named. The bird was oftenest seen on *Loranthus* and *Viscum* clumps where laden with ripe berries, and usually also on Peepal (*Ficus religiosa*) trees in fruit. It feeds extensively on both these and along with the other Flowerpeckers is largely responsible for the dispersal and propagation of the nefarious plant parasites. Owing, however, to its habit of revolving the ripe berries in its thick finch-like bill to strip them of the edible epicarp and of

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wiping off the sticky seeds on to adjoining branches—seldom swallowing them entire—it perhaps helps to spread the parasite over the same host more than in its dispersal farther afield to neighbouring trees.

The call notes, *chick-chick-chick* etc., resemble those of both the Nilgiri and Tickell's Flowerpeckers, but nevertheless are distinct enough to be easily diagnostic.

Breeding: The testes of the specimen measured 5×3 mm., and considered along with its fresh plumage suggested that it was preparing to breed shortly. No other evidence in this regard was obtained. According to the *Fauna* (iii, 435) over the rest of its range, this Flowerpecker breeds from February to April in the plains, and from April to June in the hills up to about 6,000 ft. and rarely up to 7,000 ft.

SUB-ORDER: ANISOMYODI.

FAMILY: PITTIDÆ.

Pitta brachyura (Linn.). The Indian Pitta.

Specimens collected: 98 ♂ 15-1-33 Marāiyūr 3,500 ft.; 635 ♀ 21-4-33 Arāmboli 250 ft.; 895 ♀ 24-11-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Mūnnār (5,000 ft.—Kanan Devan Hills); Sānthanpāra (3,500 ft.—Cardamom Hills); Thattākād (200 ft.); Kottāyam (ca. S.L.); Peermade (3,200 ft.); Kūmili and Periyār Lake Environs (3,000 ft.); Rājampāra (1,350 ft.—Panthalam Hills); Tenmalāi (500 ft.); Trivandrum (ca. S.L.); Kūriārkūtti (1,600 ft.—Annemalai Hills); Nemmāra (300 ft.); Pādagiri (3,000 ft.—Nelliampathy Hills); Karūpadanna (ca. S.L.).

Noted as absent in the Ashāmbu Hills (2,000-4,000 ft.) between 22 and 29 April.

Colours of bare parts: Iris brown; bill brown with orange tinge, brighter orange at gape and on basal half of lower mandible; mouth brownish, yellow and pink; legs and feet pinkish flesh-colour; claws duskier.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
2 ♂♂	23	108-110.5	36-39.5	35-38.5 mm.
2 ♀♀	24-25	106-107	39	35-35.5 mm.

Additional specimens seen:

Brit. Mus. Coll.: o? -3-75 Eridge (Hume Coll.); ♂ 30-12-79 Kallaur Road (Bourdillon); ♂ no date Mynall (Hume Coll.). Also four birds from Trivandrum (Fry).

The post-nuptial moult is complete and takes place from August to September. There is no spring moult.—H. W.]

The Pitta is apparently a winter visitor to Travancore and Cochin where the Surveys found it common. The last date on which it was noted was 21 April. It was common at this time in the scrub under the Babool groves and light deciduous jungle in the Arāmboli Gap, but curiously enough none were heard or seen during the next week in the Ashāmbu Hills at between 2,000 and 4,000 ft. elevation.

The birds were partial to mixed bamboo forest, scrub jungle, overgrown ravines etc. both deciduous and evergreen, and were met with in the neighbourhood of plantation cooly-lines and on the outskirts of towns and villages as well as far away from human habitations. Their whistling calls invariably gave the first indication of their presence in any locality. These consist of two long-drawn notes, *weet-tuew*, repeated without variation every five seconds or so, sometimes for well over 15 minutes at a stretch. The birds reply to one another for considerable periods, often three or four calling from different directions simultaneously. They are amongst the earliest risers and may usually be heard soon after the first Whistling Thrush (*Myophonus*) has proclaimed to slumbering bird-dom the inky greyness of approaching dawn. They call principally in the mornings and evenings, frequently till well after dusk. Besides the double whistling notes, they have several harsh monosyllabic *chee*-s and *mew*-s.

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When disturbed off the ground where it usually feeds, the Pitta flies up into overhanging branches of trees and very deliberately and slowly wags its stumpy tail up and down like a wagtail in 'slow motion'.

The bill and feet of a specimen shot in the vicinity of Marāiyūr village were coated with human ordure and its stomach contained a mass of maggots —presumably of the Blue-bottle Fly (*Musca vomitoria* ?)—along with some of the human excreta whence it had obtained them.

There seems to be nothing on record concerning this bird in the Palni Hills, but its status there is doubtless the same as in the Travancore and Cochin ranges. It is a winter visitor also to Ceylon. The gonads of the specimens showed no departure from the normal non-breeding condition.

ORDER: CORACIIFORMES.

SUB-ORDER: PICI.

FAMILY: PICIDÆ.

Picus xanthopygæus (Gray). The Little Scaly-bellied Green Woodpecker.

Specimens collected: 95 ♂ 14-1-33 Marāiyūr 3,500 ft.; 175 ♀ 28-1-33 Sānthanpāra 3,500 ft.; 260 ♀ 10-2-33 Thattākād 200 ft.; 624 ♀ 19-4-33 Arāmboli 250 ft.

Elsewhere noted at: Kūriārkūtti (1,600 ft.—Annemalāi Hills).

Colours of bare parts: Iris pinkish-white with inner ring of brownish-red; bill horny slate, pale yellow at sides of lower mandible except tip; mouth greyish-pink; legs and feet greyish sage green; claws horny.

[Measurements:[1]

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	36	132	88	25 mm.
3 ♀♀	31.5-34	124.5-128	78-88	22.5-24 mm.—H. W.]

The Surveys came across the Scaly-bellied Green Woodpecker from about 200 to 4,000 ft. elevation in Travancore and Cochin. In our experience it was certainly commoner than Ferguson's note (*J.B.N.H.S.*, xv, 654) would suggest, though sparingly distributed and nowhere numerically abundant. This woodpecker frequents mixed bamboo and deciduous forest with sometimes an intermingling of evergreen species. It eschews heavy jungle and keeps to open, lightly wooded country, rubber and cocoanut plantations and the like, usually singly or in pairs.

It is evidently not uncommon in the Palni Hills whence both Fairbank and Terry recorded it at Periur, Pulungi and Pittur. It also occurs in Ceylon, but is said to be rare.

Breeding: In specimen No. 95 (14 January) the testes appeared to have just commenced enlarging. The larger measured about 3×2 mm. No. 175 (28 January) had ovarian follicles enlarged to about 2 mm. in diameter and the bird seemed ready to breed shortly. No other data was obtained and there seems to be nothing recorded about its breeding in this area. At Pittur in the Palni Hills, Terry (*S.F.*, x, 471) once cut out a nest-hole at the beginning of May but it then contained no eggs.

Picus chlorolophus chlorigaster Jerdon. The Southern Indian Small Yellow-naped Woodpecker.

Specimens collected: 264 ♀ 10-2-33 Thattākād 200 ft.; 904 ♂? 26-11-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Kūmili and Periyār Lake Environs (3,000 ft.); Camp Derāmalāi (3,000-4,000 ft.—Panthalam Hills); Balamore Estate (2,000-3,000 ft. —Ashāmbu Hills).

Colours of bare parts: Iris crimson; bill horny brown or brownish-black, greenish-yellow at sides of base especially of lower mandible; mouth pink; legs and feet greyish-green or dusky olive-green; claws horny.

[1] Owing to wear, measurements of bills and tails of woodpeckers are to be used always with caution.

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[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	26	123.5	81.5	19.5 mm.
1 ♀	26	120.5	77.5	20.5 mm.

Additional specimens seen:

Brit. Mus. Coll.: ♀ 13-3-75, ♀ not dated Mynall (Bourdillon); ♂ Travancore (Bourdillon); ♀ Travancore (Gould).—H. W.]

The Yellow-naped Woodpecker is a fairly common species in the Travancore-Cochin area. It affects deciduous jungle, the mixed intermediate zone on the edge of evergreen forest and rubber plantations especially in the foothills country, and thence up to an elevation of about 3,000 ft. It is usually met with singly or in pairs. In the absence of any personal observations, I can only repeat Ferguson's quotation (*J.B.N.H.S.*, xv, 655) of F. W. Bourdillon's note: 'It is not noisy except during the breeding season. In February and March the plaintive monotonous call of these birds (which somewhat resembles the breeding call of the common Pariah Kite) may be heard at all hours of the day, as they cling motionless to the topmost bough of some tall forest tree.'

In the Palnis, Fairbank (*S.F.*, v, 396) obtained a male near Periur but is silent as regards the status of this species in those hills. In Ceylon it is represented by the race *P. c. wellsi*.

Breeding: The November specimen showed no gonadal development, but No. 264 (10 February) had soft ovarian eggs. Its oviduct was much distended, indicating that the bird was laying.

According to *Nidification* (iii, 280) Stewart took several clutches of eggs in February (earliest 3 February) around Aneichardi Estate (Central Travancore) while Bourdillon took a fresh c/3 in the same district on 8 May. The normal clutch is said to be 2 eggs, c/3 being considered exceptional.

Dryobates mahrattensis mahrattensis (Latham). The Southern Yellow-fronted Pied Woodpecker.

Specimens collected: 542 ♀ 6-4-33 Cape Comorin ca. S.L.; 798 ♀ 6-8-33 Pūlayanārkotta 200 ft.—Trivandrum Environs; 929 ♂, 930 ♀ 1-12-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Marāiyūr (3,500 ft.); Trivandrum Town; Nemmāra (300 ft.).

Colours of bare parts: Iris reddish-brown; bill pale horny grey, brownish on culmen and tips; mouth pinkish-grey; legs, feet and claws brownish-slate.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	26	96.5	55	19 mm.
3 ♀♀	22.5-23	97.5-101.5	54-56	18 mm.

The post-nuptial moult is complete and there is no pre-nuptial moult.—H. W.]

This little woodpecker is fairly common in secondary deciduous forest and lightly wooded tracts about cultivation in the low country of Travancore and Cochin. I do not think that Ferguson's description of it (*J.B.N.H.S.*, xv, 654) 'by no means common' is a very happy one. With the exception of Marāiyūr, the Surveys did not meet with it above an elevation of 400 ft. It moves about in pairs usually, but sometimes three or four birds may be seen together, and frequently as members of the localised bird associations or hunting parties.

Fairbank (*S.F.*, v, 395) collected a pair on the Palni Hills and found them not uncommon there up to 5,000 ft. In view of the very different ecological status of this woodpecker in the Travancore-Cochin area, a confirmation of Fairbank's statement seems desirable. The same race is found in Ceylon.

For an excellent paper on the tongue mechanisms of this and certain other Indian woodpeckers, based chiefly on material procured by the Surveys in Travancore and Cochin, the reader is referred to *Journal für Ornithologie*, July 1934, pp. 399-408—'Untersuchungen über den Zungenapparat indischer Spechte' by Joachim Steinbacher.

Breeding: The gonads of the specimens gave no indication as regards the

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nesting season, and no other evidence was obtained. There are evidently no published records of its breeding in our area.

Dryobates hardwickii cinereigula (Malherbe). The Malabar Pigmy Woodpecker.

Specimens collected: 370 ♂, 371 ♀ 27-2-33, 400 ♀ imm. 5-3-33 Kūmili 3,000 ft.; 1000 ♂ 20-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Nemmāra (300 ft.).

Colours of bare parts: *Adult*: Iris pale lemon yellow; skin round eye dull magenta; bill horny grey, brownish on culmen; legs and feet brownish-slate; claws horny brown; *Immature* (No. 400): Iris olive; bill horny brown, paler (greyish) at chin and basal two-thirds of lower mandible; mouth greyish-pink; legs and feet slaty; claws horny brown; soles yellowish.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
3 ♂♂	15-16	72.5-74	33.5-35	12.5 mm.
1 ♀	15	77.5	36	13 mm.

Additional specimens seen:

Brit. Mus. Coll.: ♂ 14-6-77 Machur, 4,500 ft.—Lower Palnis (Fairbank); ♀ 18-2-76 Mynall (Bourdillon).

B.N.H.S. Coll.: ♂ -4-98 Vambayam.

In this race in addition to the very dark crown an important character is the lightness of the streaking on the lower parts so that in some specimens the lower parts almost appear unicolorous dirty white.—H. W.]

The Pigmy Woodpecker was found by the Surveys to be not uncommon—though not abundant—in the foothills country from about 300 ft. elevation up to about 3,000 ft. It was observed in pairs in secondary deciduous jungle and also in the intermediate zone between it and evergreen forest, but never actually within the latter. The localised bird associations in this facies frequently included a pair. It feeds on stems of saplings close to the ground and up to moderate heights, and then again high up in the slender branches and twigs near the tops of the lofty trees. I have never observed them on the thick boles of the larger trees. The flowers of *Erythrina lithosperma* shade trees in cardamom, tea and coffee plantations in suitable biotope are regularly visited and probed into for the nectar. A specimen shot in the act of so feeding had a quantity of pollen adhering to its chin feathers.

In the Palni Hills, Fairbank (*S.F.*, v, 396) obtained a specimen and saw another at Machur on the road between the Lower Palnis and Kodaikanal. In Ceylon it is replaced by the race *D. h. gymnopthalmus* to which Ferguson erroneously attributed his Travancore specimens and Hume the one from Machur in the Palnis.

Breeding: In specimen No. 1000 (6 December) the testes had enlarged to 5×3 mm. No. 370 (27 February) had testes measuring 4×3 mm. and in its mate—No. 371—the ovarian follicles were distinctly granular. All these birds were evidently preparing to breed. No. 400 (5 March) was immature, with imperfectly ossified skull. No more precise data as regards breeding in our area is available.

Micropternus brachyrus jerdoni (Malherbe). The Southern Rufous Woodpecker.

Specimen collected: 795 ♀ 6-8-33 Pūlayanārkotta 200 ft., Trivandrum Environs.

Elsewhere noted at: Kūmili (ca. 3,000 ft.—Periyār Lake Environs). I have seen five or six specimens from Travancore in the Trivandrum Museum but without precise data.

Colours of bare parts: 'Iris brownish-red; bill upper mandible horny black, lower mandible white, horny towards the base; mouth greyish pink; legs and feet bluish-green; claws horny black' (Pillai).

[Measurements:

	Bill.	Wing.	Tail.
4 ♂♂	26-29	116.5-120.5	66.5-62.5 mm.
2 ♀♀	27-27.5	116.5-120	62-63 mm.

Additional specimens examined: 7 'Anjango' specimens in British Museum.—H. W.]

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The Rufous Woodpecker is evidently rather uncommon in Travancore, and I have no record of it from Cochin. Ferguson (*J.B.N.H.S.*, xv, 655) only saw it in the low country and at the foot of the hills, and thought that it did not ascend them. During the Survey I only came across it once—a single bird—in fairly open deciduous forest at Kūmili. Regarding his specimen also, Pillai notes that it was the first seen by him during twenty days' collecting round Trivandrum. Its call or 'laugh' is a high-pitched *ke-ke-ke-ke* somewhat of the timbre of a Myna's. Elsewhere I have observed this woodpecker clinging to the smooth trunks of banana trees, boring into the soft tissues near the base of the leaves and sucking the sap.

This species has not been recorded from the Palni Hills. The same race *jerdoni* is found in Ceylon.

Breeding: The ovary of the specimen was undeveloped. *Nidification* (iii, 304) states that Stewart obtained eggs of this woodpecker in Travancore in March and April. Two is said to be a normal clutch, but occasionally c/3 is found.

Brachypternus benghalensis tehminæ Whistler. The Malabar Golden-backed Woodpecker.

Specimens collected: 72 ♀ 12-1-33 Marāiyūr 3,500 ft.; 475 ♂ 20-3-33 Rājampāra 1,350 ft. (*Type*); 720 ♀ 24-7-33 (Thirūmalāi 120 ft.); 780 o? 3-8-33 (Kovālam ca. 70 ft.); 794 ♂ 5-8-33 (Poojappūra ca. 140 ft.) Trivandrum Environs; 940 ♀ 4-12-33 Nemmāra 300 ft.; 1033 ♂ 28-12-33 Karūpadanna S.L.

Elsewhere noted at: Kūmili and Periyār Lake Environs (3,000 ft.); Tenmalāi (500 ft.); Trivandrum Town; Kūriārkūtti (1,600 ft.—Annemalāi Hills); Wadakkāncheri (400 ft.).

Colours of bare parts: Iris brown, brownish-crimson or crimson; bill slaty-brown (horny-black), greyish on sides at base of lower mandible; mouth greyish-pink; legs and feet greenish-grey; claws horny-brown.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
6 ♂♂	39-43	135.5-151	86-95	25-26 mm.
6 ♀♀	38.5-41	138-149	88-93.5	23.5-25 mm.

There are five specimens from Travancore without proper data in the British Museum.—H. W.]

The Golden-backed Woodpecker is a common and familiar resident species in the low and foothills country of Travancore and Cochin. With the exception of Maraiyur, it was not met with above an elevation of ca. 2,000 ft., usually below 1,000 ft. It affects lightly wooded terrain, cocoanut and rubber plantations and also compounds and groves of trees in and around villages and towns. The fruit gardens about the backwater homesteads are a favourite haunt.

Contrary to our experience at Pādagiri, Kinloch (*J.B.N.H.S.*, xxvii, 941) seems to have found it 'very common' in the Nelliampathy Hills. Unfortunately he does not say to what elevation. At Nemmāra (300 ft.) along the northern base of these hills, however, the Survey noted it as common. It was usually seen in pairs and frequently as a member of the mixed hunting parties.

Fairbank (*S.F.*, v, 396) describes it as abundant in the heavy forest in the Lower Palnis. It would be interesting to know if his identification was confirmed by specimens. In Ceylon it is replaced by the race *B. b. intermedius*.

Breeding: Specimen No. 72 (12 January) had a distinctly granular ovary and No. 475 (20 March) though with testes only 3×2 mm., had a prominent incubation patch and had probably lately finished breeding. The largest ovarian follicle of No. 720 (24 July) measured about 2 mm. in diameter, and both it and No. 794 (5 August—testes 8×4 mm.) were apparently breeding. No more definite information in this regard was obtained, however. According to the *Fauna* (iv, 69) Kinloch found a nest with two eggs in the Nelliampathy Hills in March.

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Dinopium javanense malabaricum Whistler. The Malabar Golden-backed Three-toed Woodpecker.

Specimens collected: 126 ♀ 22-1-33 Sānthanpāra 3,500 ft.; 424 ♀ 9-3-33 Camp Derāmalāi 3,000 ft.; 646 o? imm., 647 o? 23-4-33 Balamore Estate (at 3,500 ft.—Ashāmbū Hills); 871 ♀ 16-11-33 Kūriārkūtti (1,600 ft.).

Elsewhere noted at: Thattākād (200 ft.); Tenmalāi (500 ft.); Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris reddish-brown to brownish-red; bill slaty-brown, grey at chin, gape and base of lower mandible; mouth greyish-pink; legs and feet greenish-grey to greyish-green; claws slaty-brown.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	31	135	87	22 mm.
4 ♀♀	26.5-31.5	137.5-139	82.5-94	22-24 mm.

Additional specimens seen:

Brit. Mus. Coll.: ♂♀ no date, ♂ 25-7-78, ♀ -10-78, ♀11-7-78, ♀♀ 5-10-74, ♂ 27-11-74 Mynall (Bourdillon); ♂ 13-1-72 Assambo Hills (Hume Coll.).

Sparrow Coll.: ♀ 26-3-14 Cardamom Hills.—H. W.]

In Travancore and Cochin, this woodpecker—in my experience—is confined more or less to the humid evergreen forest tracts, both in the low foothills country and up to an elevation of at least 4,000 ft. Ferguson says (*J.B.N.H.S.*, xv, 655) 'very common in the hills at all elevations'. Bourdillon (*S.F.*, iv, 390) considered it as one of the commonest birds in hill forest and not occurring in the low country. In this biotope it is partial to cardamom sholas where the birds move about usually in pairs on the trunks and boughs of the lofty shade trees. In localities where evergreen sholas and mixed deciduous bamboo jungle alternated, this woodpecker was noticeably more common in the former than in the latter.

It has not been recorded from the Palni Hills and it does not occur in Ceylon.

Breeding: The ovary of No. 126 (22 January) suggested that it was preparing to breed shortly. The largest follicles measured over 2 mm. in diameter. No. 646 (23 April) was definitely immature with a poorly ossified skull, and it was undergoing post-juvenal moult. This data, meagre as it is, supports the finding of Stewart and Bourdillon (*Nidification*, iii, 308) that the breeding season in Travancore is from February to April. T. F. Bourdillon found it breeding in the Ashāmbu Hills (at 3,000 ft.) in March, whilst both he and Stewart took eggs from early February to mid-April and rarely into May. A normal clutch is said to be of two or three eggs (*Fauna*, iv, 74).

Chrysocolaptes festivus Boddaert. The Black-backed Woodpecker.

Specimens not obtained. I have only a single unconfirmed sight-record of this woodpecker from Thattākād (200 ft. elevation—4-2-33) and it is evidently rare in this area. Ferguson has not included it in his Travancore list, neither has it been recorded from the Palni Hills.

Breeding: According to the *Fauna* (iv 77) Stewart obtained an egg in Travancore on 4 February from a hole in a tree in deciduous forest. I do not know if the specimen of the bird was also collected at the time, and if not, how far this record is to be relied upon.

Chrysocolaptes guttacristatus chersonesus Kloss. Malherbe's Golden-backed Woodpecker.

Specimens collected: 111 ♀ 18-1-33 Mūnnār ca. 5,000 ft.; 863 ♂ 14-11-33 Kūriārkūtti 1,600 ft.; 970 ♀ 12-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Urumbikera Forest (ca. 1,000 ft.—near Mūndakāyam); Peermade (3,200 ft.); Tenmalāi (500 ft.).

Colours of bare parts: Iris cream colour with a pinkish tinge. More precisely, a fine outer ring reddish, inner pinkish cream colour; bill dark-

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horny-brown, plumbeous at chin; mouth pale slaty pink; legs and feet greyish-green or greenish-plumbeous; claws dark horny.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	48	153	—	30.5 mm.
2 ♀♀	43.5-49.5	147-157	89	27 mm.

Other specimens examined:

Brit. Mus. Coll.: ♀ 18-6-77 Periur, Lower Palnis (Fairbank); ♀ Mynall (Bourdillon); ♀ Trivandrum (Fry); ♀ 22-2-14 Anaichardi Estate (Stewart).

The young male and the young female have the colour of the heads as in their respective sexes, and they otherwise agree with the adults except that the markings of the breast are not quite so definitly squamated.—H. W.]

This woodpecker is also fairly common in and about evergreen forest tracts. It inhabits the foothills country as well as the hills up to at least 5,000 ft. elevation. Ferguson (*J.B.N.H.S.*, xv, 655) shot it at 6,000 ft. on the High Range. It was not met with in the plains or coastal belt, either in Travancore or Cochin. It is fond of the scrub and secondary mixed jungle on the fringe of evergreen, i.e. the transition zone between the latter and the adjacent deciduous forest. It runs about on the trunks and branches of the saplings and trees, both large and small, in search of insects. The call is similar to but somewhat less harsh than that of *Brachypternus*.

In the Nelliampathy Hills, Kinloch (*J.B.N.H.S.*, xxviii, 546) discovered a woodpecker, probably this species, roosting at night on a bare branch of an *Albizzia stipulata* tree at an angle of 45 degrees from the trunk. The bird was squatting along it as if in search of food.

Fairbank (*S.F.*, v, 396) states that this species ranges in the Palnis from the base to the summit, and that it is probably the commonest woodpecker in those hills. In Ceylon it is replaced by the race *C. g. stricklandi*.

Breeding: Specimen No. 970 (12 December) had a mature ovary with some of the follicles measuring 2-2.5 mm. in diameter. Its oviduct, moreover, was distended and a prominent incubation patch was present on the abdomen. This bird was evidently breeding. The gonads of the other two specimens were in a quiescent state.

Nothing seems to be recorded about its breeding within our area proper, but according to the *Fauna* (iv, 81) in the Nilgiri and other hills of South India, this race breeds during December, January and February, and occasionally March. Betts (*J.B.N.H.S.*, xxxvii, 200) has also found eggs by the middle of December in Coorg, at between 3,000 and 5,000 ft. elevation.

Hemicircus canente cordatus Jerdon. The Malabar Heart-spotted Woodpecker.

Specimens collected: 203 ♀ 3-2-33, 211 ♀ 4-2-33 Thattākād 200 ft.; 469 ♂ 19-3-33 Rājampāra 1,350 ft.; 487 ♀ 24-3-33 Tenmalāi 500 ft.; 674 ♀ 27-4-33 Balamore Estate 2,000 ft.—Ashāmbu Hills.

Elsewhere noted at: Kūmili and Periyār Lake Environs (3,000 ft.); Kūriārkūtti (1,600 ft.); Pādagiri (3,000 ft.).

Colours of bare parts: Iris olive-brown; bill dark horny brown; mouth greyish-pink; legs, feet and claws blackish-slate in two specimens, brownish-black in three.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
2 ♂♂	20.5-22	94-94.5	34-35	17.5-18 mm.
4 ♀♀	17-18.5	84.5-91	30-32	16-18.5 mm.

Additional specimens seen:

Brit. Mus. Coll.: ♂♀ 3-12-74, ♀ 13-12-78, ♀ 15-12-79 Mynall (Bourdillon).

B.N.H.S. Coll.: [♂] 14-10-94 Mudumallai Forest (J. P. Cook); [♀] 23-8-93 Perriar, Travancore (J. P. Cook).

I find considerable difficulty in understanding the plumages of this woodpecker, but this may be due to wrong sexing of many specimens in collections.

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Of the allied *H. c. canente* Hume wrote (*S.F.*, iii, 62) that the adult male has the top of the head black with minute white spotting on all but the long crest feathers. The adult female and the young male, on the other hand—and presumably also therefore the young female—have the forehead and crown white or buffy white with the nape and crest black. I have somewhat expanded Hume's actual words. The young bird has the whole lower plumage —except of course the pale throat-patch—black, while the adult has the lower plumage either black washed with dull olive or entirely dull olive. Mr. Sálim Ali's series, so far as it goes, supports this theory of the plumages and No. 487 shows the moult from black to olive on the breast.—H. W.]

The Heart-spotted Woodpecker is not uncommon in the evergreen forest tracts of the two States, in the foothills country as well as up to an elevation of at least 3,500 ft. The Surveys usually found it in pairs affecting dense deciduous forest on the edge of evergreen jungle, or more precisely, the transition zone between the two habitat types, sometimes among bamboo clumps. I never heard it 'drumming' on a stem or branch, but merely tapping gently on the bark four or five times in succession in order to dislodge insects from the crevices.

Davison (*S.F.*, vi, 127) has drawn attention to the bristly tufts of feathers borne on the middle of the lower back by both sexes, which are clotted by a gummy substance that emits a strong resinous odour. The use of this tuft and the nature of the glands producing the viscid matter is unknown. A specimen preserved in alcohol has been forwarded to Dr. Stresemann of Berlin for histological investigation of the skin of this region, and his report is awaited. The tongue mechanism of this woodpecker has been recently studied in detail and comparatively by Joachim Steinbacher (*J.f.O.*, July 1934). It is interesting to note that the genus *Hemicircus* differs from all other woodpeckers (except the North American *Dryobates villosus*) in that the hyoid horns are curled round the right bulbus oculi, approximating to the condition described by Stresemann in his *Aves* (p. 453, fig. 463).

This woodpecker has not been recorded from the Palni Hills and it is not known to occur in Ceylon.

Breeding: The gonads of the specimens were undeveloped and no indication as regards breeding was provided by them. In Travancore, C. Primrose (*J.B.N.H.S.*, xxxv, 207) took eggs from holes excavated by the birds in fencing posts round a plantation—3 ft. from the ground—on 26 November and 15 December. Usually, however, it is said to make a tunnel in a dead branch of a tree standing in forest, at considerable heights. Stewart(*Nidification*, iii, 313) took two clutches of three eggs each on 8 January and 3 May. It would appear, therefore, that the breeding season in Travancore is a prolonged one.

Macropicus javensis hodgsonii (Jerdon). The Malabar Great Black Woodpecker.

Specimen collected: 123 ♂ 22-1-33 Sānthanpāra 3,500 ft.

Elsewhere noted at: Thattākād (200 ft.); Camp Derāmalāi (3,000 ft.—Panthalam Hills); Kūriārkūtti (1,600 ft.—Annemalāi Hills); Pādagiri (3,000 ft. —Nelliampathy Hills).

Colours of bare parts: Iris yellowish cream colour; bill horny-slate, paler on sides of lower mandible; legs and feet greyish-slate; claws horny-brown.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
2 ♂♂	64.5	217.5-222	163-166.5	36 mm.

Additional specimens seen:

Brit. Mus. Coll.: ♂ no date Mynall (Hume Coll.); ♀ 26-11-79, ♀ 8-12-74 Mynall, 3,000 ft. (Bourdillon).—H. W.]

This magnificent woodpecker is confined to the evergreen forest biotope in Travancore and Cochin. The Surveys came across it from the foothills country as at Thattākād up to an elevation of at least 3,500 ft. It was not uncommon locally and in patches, but nowhere numerically abundant. Cardamom sholas and well-shaded tea and coffee plantations constitute favourite haunts, and like several of the forest-loving woodpeckers described previously, it is most partial to the densely wooded intermediate zone on the edge of evergreen sholas with

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a free intermingling of the evergreen and deciduous types of vegetation, often including bamboo. The birds were met with in pairs and occasionally singly, but as they were manifestly breeding at this time these latter may have been individuals whose mates were on eggs.

The loud metallic call of a single note—*clang*—is repeated every two seconds or so while the bird scuttles in short spurts up and around the trunk of a lofty tree, or during flight from one patch of forest to another. This sound carries a great distance. The stomach of the specimen contained a fat, juicy larva of some wood-boring beetle about 1½ in. (40 mm.) long.

Neither Fairbank nor Terry have included this species in their Palnis lists, though it doubtless occurs there in suitable facies. From an ecological point of view it seems rather curious that this woodpecker does not occur in Ceylon.

Breeding: The testes of the specimen (22 January) measured 16×7 mm. and it was undoubtedly breeding. According to Kinloch (*J.B.N.H.S.*, xxix, 561) eggs—normally c/2, not 1—are laid in the Nelliampathies in January. The nest-hole is usually excavated at heights of 35-50 ft. from the ground. The entrance is about 6 in. in diameter, the hollow itself being 2-2½ ft. deep. During excavation by the birds the ground for some yards round the base of the tree becomes littered with fragments of wood. On 7 March, Kinloch found two naked chicks in a hole 20 ft. up in a *Grevillea robusta* tree (*J.B.N.H.S.*, xxvii, 942).

Vivia innominatus avunculorum (Hartert). The Nilgiri Speckled Piculet.

Not met with by the Surveys. Ferguson (*J.B.N.H.S.*, xv, 656) only shot a single specimen of this little woodpecker in dense forest on the hills in South Travancore at ca. 4,000 ft., and saw another on the same day. Both were on living trees. I have seen a single fragmentary skin in the Trivandrum Museum labelled 'Chemunji, April 1893 (or 1898?)' which is probably the one referred to above.

According to the *Fauna* (iv, 94) Stewart and Bourdillon both obtained it in the Travancore hills. It has not been recorded from the Palni Hills and it does not occur in Ceylon.

Family: Capitonidæ.

Thereiceryx zeylanicus zeylanicus (Gmel.). The Ceylon Green Barbet.

Specimens collected: 599 ♂ 15-4-33 Arāmboli 250 ft.

I have seen a specimen in the Trivandrum Museum from Vembayam ca. 12 miles North-East of Trivandrum town.

Elsewhere noted at: Thattākād (200 ft.); Karūpadanna (ca. S.L.—unconfirmed and doubtful).

Colours of bare parts: 'Bill reddish, darker at tip; patch round eye yellow; legs yellow; claws horny' (Humayun and Pillai).

[The single specimen agrees definitely with the typical race from Ceylon as do a series of nine 'Anjango' specimens in the British Museum. In the *New Fauna* (iv, 109-111) the typical race is said to be confined to the southern quarter of Travancore, and this is again emphasised in *Nidification* (iii, 326), while *T. z. inornatus* is said to occur in the rest of the country. I can find no evidence in support of this division of races in Travancore. Besides the above 'Anjango' specimens I have seen only two other specimens from Travancore, a female of the typical race obtained at Kuravenuth (?) by J. P. Cook on 29-8-93 (Society's Collection) and a specimen in the British Museum collected by Surgeon-General Fry at Trivandrum and labelled *inornatus*. The latter is, in my opinion, a worn specimen of the typical race and Trivandrum is of course right in the south of the country.—H. W.]

The Ceylon Green Barbet is, on the whole, not a common bird in Travancore and Cochin. The Surveys only came across it in the low country where it was fairly abundant though locally and patchily distributed. Ferguson (*J.B.N.H.S.*, xv, 656) once shot a specimen in the hills at 4,000 ft. elevation, but this was doubtless exceptional. Its voice and call—*Krrr, kr-r-r, kutroo, kutroo*, etc.—is slightly different from that of the much commoner and almost ubiquitous Small Green Barbet, but still sufficiently like it to confuse the

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hearer. At Thattākād I commonly observed this Barbet feeding on the nectar of *Bombax malabaricum* flowers in the usual mixed avian company.

It has not been recorded from the Palni Hills. It is found in Ceylon in the low country and up to about 4,000 ft. elevation.

Breeding: The specimen (15 April) had testes enlarged to 10×5 mm. It was in fresh plumage and evidently breeding. *Nidification* (iii, 326) records that Stewart took two nests, each containing c/3 in the extreme south of Travancore on 7 March.

Thereiceryx viridis Boddaert. The Small Green Barbet.

Specimens collected: 7 ♀ 4-1-33 Marāiyūr 3,500 ft.; 233 ♀ 7-2-33 Thattākād 200 ft.; 685 ♂ 18-7-33 (Public Gardens); 744 ♂ 29-7-33 (Kūttāni, ca. 300 ft.); 833 ♀ 11-8-33 (Pūlayanārkotta ca. 200 ft.) Trivandrum Town and Environs; 872 ♂ 16-11-33 Kūriārkūtti 1,600 ft.; 1035 ♀ 28-12-33 Karūpadanna ca. S.L.

Elsewhere noted at: Sānthanpāra (3,500 ft.); Kottāyam (ca. S.L.); Peermade 3,200 ft.); Kūmili and Periyār Lake Environs (3,000 ft.); Camp Derāmalāi (3,000 ft.); Rājampāra (1,350 ft.); Tenmalāi (500 ft.); Balamore Estate (2,000 ft.); Chālakūdi; Wadakkāncheri (400 ft.); Nemmāra (300 ft.); Pādagiri (3,000 ft.).

Colours of bare parts: Iris chestnut-brown or dark brown; eyelids or circumorbital rim slaty-black; bill brownish flesh-colour, browner on culmen, plumbeous at gape; mouth pinkish-grey; legs and feet greenish-grey; claws horny-brown.

[Additional specimens examined:

Brit. Mus. Coll.: A series from the Palnis (Fairbank); a series from Mynall (Bourdillon); ♀ -3-72 Glengarnock (Bourdillon); ♂ 21-2-70 Cardamom Hills (W. Davison).

B.N.H.S. Coll.: ♀ 9-6-93, ♂ 22-6-93 Palnis.

H. Whistler Coll.: o? 12-5-23 Nelliampathies 3,600 ft. (Kinloch).

There is a complete post-nuptial moult, starting about May and June, but no spring moult. Worn birds are paler in colour especially on the crown and breast, the latter becoming much whiter with the wearing off of the brown margins to the feathers.

The juvenile plumage is similar to that of the adult except that the streaking of the head, neck and breast is not so well-defined and the head is rather paler.—H. W.]

The Small Green Barbet is a very common species throughout Travancore and Cochin, being found in the low country as well as up to at least 4,000 ft. in the hills. It frequents all types of forest and also gardens and groves in the neighbourhood of towns, villages and cultivation, and its monotonous call of *kutroo-kutroo* etc. may be heard on all sides. In March it was noted as particularly obstreperous, calling unceasingly all day long, and sometimes also during moonlit nights. As soon as one bird begins to call he is almost invariably joined in by another from some distance, and this uneven duet is kept up for a considerable time. The birds keep singly or in pairs, but are most often met gregariously—frequently twenty or more—on some *Ficus* or other tree in fruit where they foregather in company with numerous other frugivorous species. Their food consists to a very large extent of Banyan or Peepal figs and those of the various other species of *Ficus*. *Lantana* berries are likewise eaten, and I have even observed one devouring a green grasshopper. In coffee plantations they do considerable damage to the ripening 'cherries', the epicarp of which they greatly relish. Nectar of *Erythrina lithosperma* and *Grevillea robusta* is also regularly sought after, and from the pollen adhering to the forehead and throat feathers of specimens shot off these flowers, it is evident that they assist in cross-pollination.

Fairbank (*S.F.*, v, 396) writes that in the Palni Hills this barbet is found abundantly in groves and trees at all elevations. It does not occur in Ceylon.

Breeding: Specimen No. 1035 (28 December) was undoubtedly breeding. Its largest ovarian follicle measured 4 mm. in diameter. In No. 7 (4 January) the follicles were about 1 mm. in diameter and appeared to be enlarging. On 31 January a bird was observed clinging outside a nest-hole in a dead branch

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of a tree standing on the edge of forest. The gonads of the July-August specimens were in a quiescent state, and the birds were undergoing post-nuptial moult. According to Kinloch (*Nidification*, iii, 331) it breeds in the Nelliampathy Hills in February. F. W. Bourdillon obtained two unfledged chicks from a nest in the South Travancore hills early in April (*S.F.*, iv, 391).

Xantholœma hæmacephala indica (Latham). The Crimson-breasted Barbet.

Specimens collected: 52 ♀ 10-1-33 Marāiyūr 3,500 ft.; 684 ♀ 17-7-33 (Beach); 758 ♂ 31-7-33 (Akkūlam ca. 150 ft.); 763 ♀ 1-8-33 (Public Gardens) Trivandrum Town and Environs.

Elsewhere noted at: Kottāyam (ca. S.L.); Cape Comorin; Arāmboli (250 ft.); Kūriārkūtti (1,600 ft.); Wadakkāncheri (400 ft.); Trichūr.

Colours of bare parts: Iris dark brown ('greyish-brown'—Pillai); eyelids coral-red; bill horny black, cream coloured at chin; mouth greyish-pink; legs and feet dull coral-red; claws black.

[Measurements:

	Bill.	Wing.	Tail.
1 ♂	18	79	33 mm.
3 ♀♀	18.5-19	77-80.5	31.5-33.5 mm.

The only other Travancore specimens seen are four unsexed birds with no precise data.

A complete post-nuptial moult, beginning about July. No spring moult. The juvenile is similar to the adult but the green is rather greyish in tint. The forehead, crown and nape are uniform with the rest of the upper parts, i.e. they lack the red, black and grey of the adult. The yellow above and below the eye is paler, the black behind the eye and ear-coverts and on the moustachial streak is duller and less in extent; the chin and throat are greyish-white, tinged with yellow round the chin and sides; breast greyish-green, merging into the streaking of the lower breast and flanks. The post-juvenal moult is presumably complete as the first-year bird is in no way distinguishable from the adult.—H. W.]

With the exception of Marāiyūr, where it was common, the Coppersmith was only met with by the Surveys in the low country below 500 ft. Ferguson (*J.B.N.H.S.*, xv, 657) says that at times it may be found in the hills up to 1,500 ft. elevation. It frequents lightly wooded terrain about cultivation, groves of trees near villages and human habitations, also the gardens and compounds of the larger towns. Its diet consists principally of Peepal and Banyan figs, and large numbers of birds collect on the trees laden with these fruits.

In the Palni Hills, according to Fairbank (*S.F.*, v, 397), it is common at the base and up to 4,000 ft. I do not know if Fairbank obtained specimens, but if not I suspect he may have confused it with *malabarica*. Confirmation is desirable. It occurs in the drier areas of Ceylon.

Breeding: The ovary of No. 684 (17 July) has been drawn by Mr. Pillai as distinctly granular with some of the follicles measuring over 1 mm. in diameter. The specimen, however, was undergoing post-nuptial moult and so had apparently lately finished breeding. According to Ferguson, T. F. Bourdillon obtained eggs near Courtallum (at ca. 1,500 ft.) in March, but I am not sure if this same record is not referred by F. W. Bourdillon (*S.F.*, iv, 392) to the Crimson-throated species!

On 8 April (Cape Comorin) Humayun Abdulali found a nest excavated in a vertical Drumstick (*Moringa oleifera*) branch at a height of 15 ft. It contained c/2 slightly set. The eggs measured 24×18 mm. and 23×16 mm. respectively. They were laid in the hollow about 6 in. deep, on chips of wood which had apparently fallen in during excavation. Humayun noted that the chips were wet (in spite of the dry weather) as was also the abdomen of the sitting bird.

Xantholœma rubricapilla malabarica (Blyth). The Crimson-throated Barbet.

Specimens collected: 199 ♀ 24-1-33 Sānthanpāra 3,500 ft.; 502 ♀ 27-3-33 Tenmalāi 500 ft.

Elsewhere noted at: Thattākād (200 ft.); Kūmili (3,000 ft.); Balamore Estate (2,000 ft.—Ashāmbu Hills); Pādagiri (3,000 ft.—Nelliampathy Hills).

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Colours of bare parts: Iris brown; bill upper mandible horny-brown, lower pale flesh colour at chin, plumbeous at gape and sides except near terminal portion, which brownish; mouth greyish-pink; legs and feet coral pink; claws horny-brown.

[Other specimens seen from Travancore:
Sparrow Coll.: o? 14-5-14 Cardamom Hills.
Brit. Mus. Coll.: ♀ 21-2-70 Cardamom Hills 4,000 ft. (Also four birds with no proper data).

Measurements:

	Bill.	Wing.	Tail.
3 ♀♀	17-18	80-87.5	35-39 mm.

For a note on the juvenile plumage and my reason for considering this a race of the Ceylon bird, see Eastern Ghats Survey Report (*J.B.N.H.S.*, xxxvii, 517).—H. W.]

I agree with Ferguson (*J.B.N.H.S.*, xv, 657) that Bourdillon's description of the status of this barbet in Travancore is entirely misleading. I would go further and say that in my experience both in Travancore and in Cochin, the Crimson-throated Barbet more or less completely replaces the Crimson-breasted species in evergreen biotope, both in the foothills and higher up—to 4,000 ft. at least. A scrutiny of the localities where the two species were met with by the Surveys will show this clearly. It is common in suitable localities, and like its low country congener, resorts to feed gregariously on the various Fici in company with Green Pigeons, Hornbills and numerous other frugivorous birds.

I found its voice and call indistinguishable from the foregoing species.

Fairbank's Palni list (*S.F.*, v) omits this species altogether. I suggest what has probably happened is that in giving the range of *haemacephala* as 'Common at base and up to 4,000 ft.' he has muddled up the two species, the one being found presumably in the drier country about the base and the other in evergreen biotope higher up. Confirmation is desirable.

The typical race *X. r. rubricapilla* replaces it in Ceylon where it is said to be a bird of the low country, extending up to 2,500 ft.

Breeding: Both the specimens (24 January and 27 March) had conspicuously granular ovaries, and in the latter a prominent incubation patch was present besides. On 5 March (Kūmili) an individual was observed emerging from a nest-hole in the stump of a vertical *Erythrina* branch, about 20 ft. up, and it was evidently breeding.

The record of eggs obtained by Bourdillon early in March (*Nidification*, iii, 340) is doubtful as Mr. Whistler has shown (*J.B.N.H.S.*, xxxvii, 517).

(*To be continued*).

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THE MEDICINAL AND POISONOUS ORCHIDS OF INDIA.

BY

J. F. CAIUS, S.J., F.L.S.

The ORCHIDACEAE include about 610 genera with over 8,000 species, mostly natives of tropical and subtropical countries, less frequent in temperate countries, a few being found in cold mountainous regions.

The medicinal and poisonous Orchids of the world belong to 38 distinct genera:—ACAMPE (Indo-Malaya, Africa); ACERAS (Mediterranean); ANACAMPTIS (Europe, North Africa); ANGRAECUM (La Reunion, Mauritius); ANSELLIA (Tropical Africa); APLOSTELLIS (Old World tropics and subtropics); BLETIA (Tropical America); CORALLORHIZA (North America); CREMASTRA (Japan); CYMBIDIUM (Tropical Asia, Africa, Australia); CYPRIPEDIUM (Northern cold and temperate regions, Mexico); CYRTOPODIUM (America); DENDROBIUM (Tropical Asia to Japan, Australia, Polynesia); DESMOTRICHUM (Indo-China, Malay Islands); EPIDENDRUM (Tropical America); EULOPHIA (Africa, Indo-Malaya); GALEANDRA (Tropical America); GASTRODIA (Indo-Malaya, Japan, China, Australia); GOODYERA (Europe, Asia, Mascarene Islands, North America); GOVENIA (Tropical America); GYMNADENIA (Europe, Asia); HABENARIA (whole world); HETAERIA (Africa, Indo-Malaya, Polynesia); LIMODORUM (Mediterranean); LISSOCHILUS (Africa); LUISIA (Indo-Malaya, Polynesia); MICROSTYLIS (cosmopolitan; chiefly tropical); MONADENIUM (Africa); NEOTTIA (Temperate Europe, Temperate Asia); OBERONIA (Old World Tropics, Japan); OPHRYS (Europe, Mediterranean); ORCHIS (Mediterranean, Temperate Europe, Asia, North America, North Africa); PLATANTHERA (North America, Tropical Asia, Africa); RHYNCHOSTYLIS (Indo-Malaya); SACCOLABIUM (Africa, Indo-Malaya, China); VANDA (Asia, Australasia); VANILLA (All tropical countries); ZEUXINE (Tropical Asia, Africa).

The medicinal and poisonous Orchids of India belong to 15 distinct genera:—ACAMPE, CYMBIDIUM, DENDROBIUM, DESMOTRICHUM, EULOPHIA, HABENARIA, HETAERIA, LUISIA, OBERONIA, ORCHIS, RHYNCHOSTYLIS, SACCOLABIUM, VANDA, VANILLA, ZEUXINE.

A. Anther 1, opercular. Pollinia waxy, 1·4 in each cell:
   1. Column footless. Lip entire or lobed, with a nectar depression at base ... ... OBERONIA.
   2. Column with a long foot. Lip adnate to the produced foot of the column, contracted at the base or clawed:
      a. Flowers fascicled ... ... DESMOTRICHUM.
      b. Flowers solitary or in fascicles or racemes ... DENDROBIUM.

B. Anther 1, posticous. Pollinia waxy, usually 2 or 4:
   1. Scape usually leafless. Petals like the dorsal sepal; lip gibbous or saccate, rarely spurred ... EULOPHIA.
   2. Sepals and petals subequal, spreading; lobes of the lip embracing the unwinged column. Leafy stems short, pseudobulbous ... ... CYMBIDIUM.

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3. Sepals and petals fleshy, widely spreading from a narrow base. Flowers large, in simple racemes. VANDA.
4. Sepals and petals subequal. Columns short stout, no foot. Flowers small pink or white crowded in dense racemes showy; lip entire ... ... RHYNCHOSTYLIS
5. Sepals and petals widely spreading. Column without appendages. Flowers small, in simple or branched racemes; lip 3-lobed with callus in the spur mouth ... ... SACCOLABIUM.
6. Sepals and petals thick, concave. Flowers small, crowded in a short rigid, simple or branched peduncle; lip obscurely 3-lobed, no callus ... ACAMPE.
7. Sepals subequal or the depressed dorsal smaller. Petals narrower often longer, spreading. Column much shorter than the lip, truncate. Flowers few in short lateral spikes. Lip sessile on column base, divided into basal and apical parts ... LUISIA.

C. Stem not bulbous. Anther 1, posticous, opercular or erect and persistent. Pollen granular, powdery or in small masses:
1. Sepals and petals subequal, spreading. Column long, anther broad ... ... VANILLA.
2. Sepals free, dorsal with the petals cohering in a hood; lip with dilated end. Column very short with lamellar or conic processes in front ... ZEUXINE.
3. Upper sepal usually adnate to petals pubescent; lip without a dilated end. Column rather large with long rostellar arms ... ... HETAERIA.

D. Anther 1, posticous, erect, inclined or reflexed. Pollinia 1 rarely 2 in each cell, granular, produced into short caudicles. Terrestrial herbs:
1. Lip spurred. Glands of the pollinia both in one pouch ORCHIS.
2. Lip spurred, sepals equalling or exceeding the petals. Flowers spicate or racemose; rostellum not elongate ... ... HABENARIA.

It is chiefly as sources of SALEP that orchids have become therapeutically famous, and it is as sources of salep that some species are still retained in the pharmacopoeias of Austria, Belgium, Germany, Holland, Japan, Norway, Portugal, Russia and Switzerland.

Salep is the name given to the tubers or tuberous roots of various orchids, collected in the flowering season, immersed in boiling water for a short time, and dried. At present the salep of European commerce is prepared chiefly in the Levant, but to some extent in Germany and other parts of Europe. The tubers are collected from wild plants growing in Asia Minor, South-west Asia, France and Germany. The salep of the Indian bazars is produced in the hills of Afghanistan, Baluchistan, Persia and Bokhara; a part of it is obtained from the Nilgiri Hills and also from Ceylon.

From ancient times salep has been considered to possess great invigorating virtues, and has hence been extensively prescribed both in Europe and the east for recruiting the exhausted vitality of aged and enervated persons. An infusion or decoction was taken generally in England as a beverage before the introduction of tea and coffee. Sassafras chips were sometimes added for giving the drink a flavour.

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Though its medieval and oriental reputation as an aphrodisiac has been irretrievably lost in the West, salep is still considered highly nutritive and a most useful article of diet for those who suffer from chronic diarrhoea. All scientific opinion, however, concurs in the belief that salep is devoid of medicinal virtue and that it is highly doubtful if its nourishing properties are as great as they are supposed to be.

In the east, nevertheless, faith in the efficacy of the drug is still unshaken and the dry tuber has an immense reputation as an aphrodisiac, a nervine restorative, and a fattener. It is much used by *vaids* and *hakims* in conjunction with other nervine tonics. It is also considered a very nourishing article of diet, and is given mixed with milk and flavoured with spices and sugar. In fact salep is so very highly esteemed and is in such great demand that 'imitation salep' is largely prepared for the Indian trade. Wealthy Orientals are known to have paid a handsome price for pounded potatoes and gum. 'Royal Salep', said to be much used as a food in Afghanistan, has been identified as the product of a liliaceous plant, *Allium macleanii* Baker.

The Order is remarkable for the absence of poisonous properties; only in so far, however, as trifles may be neglected, for three species are considered toxic. The natives of Portuguese East Africa say that a liquid extract of *Monadenium lugardae* N. E. Br. is poisonous and produces vomiting; the leaves and stem of the Malayan *Vanilla griffithii* Reich. f. contain an irritating latex; reports of violent dermatitis in workmen handling vanilla beans, *Vanilla planifolia* Andrews, are not uncommon.

It is no less interesting to note that four orchids are used in the treatment of various forms of insanity. Natives in the Mpika district of Northern Rhodesia administer an infusion of the leaves and stems of *Ansellia humilis* Bull. as a remedy for madness; American Indians give a decoction of the Swamp Orchid, *Simodorum giganteum* Thunb., to combat manias; on the Malabar Coast the powdered flowers of *Vanda spathulata* Spreng. are said to abate frenzy; and in France the fruit of *Vanilla planifolia* Andrews is prescribed in order to overcome melancholia.

Acampe.

This genus contains 12 species, mostly Indo-Malayan and Chinese, a few African.

Acampe wightiana Lindl. (=*Saccolabium praemorsum* Hook. f. =*S. Wightianum* Hook. f.) is found throughout Bengal, the Western Peninsula, and Ceylon.

The plant is a bitter tonic. It is used in rheumatism.

Canarese: Marakale—; *Malayalam*: Taliyamaravala—; *Marathi*: Kanbher—.

Cymbidium.

The 30 species which constitute this genus inhabit Africa, Asia, Australia, extending as far as Japan.

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Cymbidium aloifolium Swartz occurs in Nepal, the Terai, tropical Himalaya, eastwards to Sikkim, Western and Southern India, Ceylon.

The plant is said to be emetic and purgative.

English: Boat Orchid—.

Dendrobium.

Epiphytic herbs belonging to about 750 species and distributed throughout Tropical Asia, Japan, Australia and Polynesia.

D. ceraia Lindl., *D. moniliforme* Swartz, *D. nobile* Lindl. are used medicinally in China; *D. reptans* Franch. and Sav. is similarly used in Japan.

Two Indian species are credited with therapeutic properties:

1. Stems tufted, 12-18 in. long, usually slender. Flowers in lateral and terminal racemes 3-6 in. long *D. ovatum.*
2. Pseudobulbs tufted, cylindric or dilate upwards, 2 in. long. Flowers 1 or 2 from terminal tuft of bracts ... ... *D. pumilum.*

1. **Dendrobium ovatum** (Willd.) Kranzl. (=*D. chlorops* Lindl.) is found on the Western Ghats and the Western Coast of the Madras Presidency.

The plant is an emollient. The juice of the fresh plant is given internally for all kinds of stomach ache; it excites the bile and acts as a laxative to the intestines.

Malabar: Maravar—; *Marathi*: Nagli—.

2. **Dendrobium pumilum** Roxb. is very common on orchard trees in the Malay Peninsula whence it extends to Burma and Borneo.

The Malays use it as a drug in dropsy.

Malay: Sakat kalumbai—.

Desmotrichum.

The genus consists of about 30 Indo-Malayan species.

Desmotrichum fimbriatum Bl. (=*Dendrobium macraei* Lindl.) inhabits the Western Ghats of the Bombay and Madras Presidencies, Ceylon, Sikkim, the Khasia Hills, Burma, the Malay Peninsula, whence it spreads to Siam, Borneo and the Philippine Islands.

Sanskrit writers describe the plant as cold, mucilaginous, light, strengthening, and as a remedy for disorders of the bile, blood and phlegm. The whole plant is used in decoction along with other drugs supposed to have similar properties. The fruit is said to be an aphrodisiac.

The plant is prescribed by Sushruta, in combination with other drugs, for the treatment of snake-bite and scorpion-sting; but Mhaskar and Caius have proved experimentally that it is not an antidote to either snake-venom or scorpion-venom.

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The plant is occasionally used alone as a stimulant and tonic. As a tonic it is given in debility due to seminal losses.

Bengal: Jibai, Jibanti—; *Gujerati*: Jivanti, Radarudi, Wajhanti—; *Hindi*: Jiban, Joivanti, Sag—; *Marathi*: Jivanti—; *Sanskrit*: Bhadra, Jiva, Jivabhadra, Jivada, Jivani, Jivaniya, Jivanti, Jivapatri, Jivapushpi, Jivavardhini, Jivavrisha, Jivdatri, Jivya, Kanjika, Kshudrajiva, Madhushvasa, Madhusrava, Mangalya, Mrigaratika, Payaswini, Pranada, Putrabhadra, Raktangi, Shakashreshtha, Shashashimbika, Shringati, Srava, Sukhankari, Supringala, Yashaskari, Yashasya—.

Eulophia.

This genus numbers 200 species distributed through the warm countries of the Old World; they are especially numerous in Africa and Indo-Malaya.

E. arenaria Bohn., *E. flaccida* Schltr., *E. hians* Spreng., *E. robusta* Rolfe are used medicinally in South Africa.

Among Eulophias which furnish salep to the Indian bazaars may be mentioned *E. campestris* Wall., *E. herbacea* Lindl., *E. nuda* Lindl. and *E. pratensis* Lindl.

A. Column produced into a foot. Flowers large; lateral sepals inserted on the spur of the lip ... ... *E. nuda.*

B. Column not produced into a foot:
1. Scape 7-12 in. long, sheathed at intervals by loose membranous bracts. Sepals linear-lanceolate. Petals narrower than the sepals, oblanceolate ... *E. campestris.*
2. Scape 1-3 ft. long with appressed acute sheaths. Sepals elliptic-oblong. Petals shorter and broader than the dorsal sepal, elliptic-oblong, obtuse. Lip broader than long ... ... *E. pratensis.*
3. Scape stout, 2-3 ft. high with large acuminate sheaths. Sepals linear-lanceolate. Petals oblong-elliptic, obtuse or subacute. Lip longer than broad ... ... *E. herbacea.*

1. **Eulophia campestris** Wall. is found in the sub-Himalayan tracts of Rohilkhand and North Oudh, Nepal, Sikkim, Chittagong, Bengal, Upper Burma, Baluchistan and Afghanistan.

Ayurvedists consider the tuber tonic, stomachic, aphrodisiac and alterative; they commonly give it to stimulate appetite and to purify the blood in heart troubles.

Yunani doctors credit the tuber with tonic, aphrodisiac and astringent properties; they consider it useful in stomatitis, purulent cough and paralytic conditions.

The plant furnishes a salep which is much prized by Indians as a tonic and aphrodisiac.

Arabic: Khusyu-uth-thalab—; *Bengal*: Salibmisri, Sungmisric—; *Gujerati*: Salum—; *Hindi*: Salibmisri—; *Marathi*: Salamishri—; *Nepal*: Hattipaila—; *Persian*: Sungmisri—; *Punjab*: Salibmisri—; *Sanskrit*: Amrita, Amritodbhava, Jiva, Jivani, Pranabhrita, Pranada, Sudhamuli, Virakanda—; *Santal*: Bongataini—; *Urdu*: Salabmisri—.

2. **Eulophia herbacea** Lindl. is found in the Western Himalaya and Western Peninsula; it is met with in Kanara, Konkan and Gujerat.

The tuber furnishes an esteemed kind of salep.

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3. **Eulophia nuda** Lindl. occurs in Tropical Himalaya from Nepal eastwards to Sikkim, in Chota Nagpur, Assam, the Khasia Hills, Manipur, Burma, the Western Peninsula and Ceylon.

Hindu practitioners use the tuber in tuberculous glands of the neck, tumours, bronchitis and diseases of the blood; they say it gives appetite and prescribe it accordingly.

The pounded fresh plant is applied to boils and abscesses to promote maturation and suppuration.

The powdered tuber is said to be an antidote for poisoning; it is administered internally to those suffering from intestinal worms.

The plant is a source of salep.

Bengal: Budbar—; *Hindi*: Ambarkand, Gourma—; *Marathi*: Ambarakand, Bhuikakali, Manakanda—; *Sanskrit*: Balakanda, Granthidala, Kandalata, Malakanda, Panktikanda, Trishikhadala—.

4. **Eulophia pratensis** Lindl. is apparently endemic in the Western Peninsula; it is found in the pasture-lands of the Deccan, in the Sholapur District and in Belgaum.

The tubers are applied externally and given internally to remove scrofulous glands in the neck. They are also administered internally as a worm remedy. They make up a large portion of the salep of Western India.

Marathi: Satavari—.

Habenaria.

The genus contains about 500 species, widely diffused through tropical and subtropical regions.

An infusion of the root of *H. foliosa* Reichb. fil. is used as an emetic by the Zulus.

Habenaria commelinifolia Wall. occurs in the outer ranges of Western Himalaya from the Punjab to Kumaon up to 5,000 ft., extending eastwards to Parasnath, Chota Nagpur, Bihar and Upper Burma, Central India, Konkan, Western Ghats, Deccan, North Kanara and Bababudan Hills.

The plant is a source of salep.

Sadani: Jadu, Jaitjadu—.

Hetaeria.

The 40 species which make up this genus inhabit Africa, Indo-Malaya and Polynesia.

Hetaeria obliqua Bl. is common in the woods of the Malay Peninsula, extending thence to Sumatra and Borneo.

The plant is used by the Malays for poulticing sores.

Malay: Poko tumbak hutan—.

Luisia.

The genus numbers about 15 species, mostly tropical Asiatic, a few Australian.

Luisia tenuifolia Bl. inhabits the Western Peninsula and Ceylon.

The pounded plant is used as an emollient. It is applied as a poultice to boils, abscesses and tumours.

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Oberonia.

The genus consists of about 60 species, tropical Asiatic, Australian and Pacific.

Oberonia anceps Lindl. is common throughout the Malay Peninsula; it extends to Tenasserim and Java.

The Malays use the leaves for poulticing.

Malay: Sakat lidah buaya—.

Orchis.

The 70 species of this genus are found in Europe, temperate Asia, North Africa and America.

The following are used in Europe for the preparation of salep:— *O. bifolia* Linn., *O. fusca* Linn., *O. hircina* Linn., *O. latifolia* Linn., *O. laxiflora* Lam., *O. maculata* Linn., *O. mascula* Linn., *O. militaris* Linn., *O. morio* Linn., *O. pyramidalis* Linn., *O. sambucina* Linn., *O. simia* Lam.

Orchis latifolia Linn. occurs in the Western Temperate Himalaya from Nepal to Kashmir, and Western Tibet at altitudes between 8,000 and 12,000 ft. It extends to Northern Asia and through Afghanistan to North Africa and the Atlantic. It usually grows in damp meadows and marshes.

The tubers are expectorant and astringent. They yield salep.

English: Marsh Orchid—; *Spanish*: Palma Christi—.

Rhynchostylis.

The genus consists of 2 Indo-Malayan species.

Rhynchostylis retusa Bl. is distributed throughout India, Burma, the Malay Peninsula, Siam, Java, the Philippine Islands and Ceylon.

The fresh plant is used as an emollient.

Saccolabium.

This genus comprises about 200 species, inhabitants of Africa, Indo-Malaya and China.

Saccolabium papillosum Lindl. is found in Bengal and the lower Himalaya Mountains from Sikkim eastwards, Assam, the Gangetic Delta and Tenasserim.

The root is considered a specific for rheumatism. It is commonly used as a substitute for sarsaparilla and for *Vanda tessellata*.

In the Konkan the roots are used as a cooling remedy.

Marathi: Nakuli, Rasna—; *Sanskrit*: Gandhata, Nakuli, Rasna—.

Vanda.

The genus consists of about 30 species found in Tropical Asia and Australia.

Two Indian species are credited with therapeutic properties.

1. Flowers 1.2 in. diam., golden yellow ... ... *V. spathulata*.
2. Flowers 1.5-2 in. diam., tessellated with brown ... *V. tessellata*.

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1. **Vanda spathulata** Spreng. occurs in the Western Peninsula from Malabar to Travancore and Ceylon.

On the Malabar Coast the juice of the plant is supposed to temper the bile and abate frenzy. The golden yellow flowers, reduced to powder, are given in consumption, asthma and mania.

Malayalam: Ponnamponmaraiva—.

2. **Vanda tessellata** Hook. (=*V. Roxburghii* R. Br.) is found in Bengal, Chota Nagpur, Bihar, the Central Provinces, the Western Peninsula, Travancore and Ceylon.

Ayurvedists consider the root antipyretic and an antidote for poisoning; they use it in dyspepsia, bronchitis, inflammations, rheumatic pains, hiccough, tremors and diseases of the abdomen.

Yunani practitioners hold it to be laxative, and tonic to the liver and the brain; they prescribe it for bronchitis, piles, lumbago, toothache and boils on the scalp; they further say that it lessens inflammation and heals fractures.

Rasna root is commonly prescribed in a variety of forms for rheumatism and allied disorders. It enters into the composition of several medicated oils for external application in rheumatic pains and diseases of the nervous system.

In Chota Nagpur, the leaves pounded and made into a paste are applied to the body during fever, and the juice is introduced into the aural opening for inflammation of the middle ear.

The plant is occasionally given as a cure for snake-bite. Combined with other drugs it forms some of Charaka's and Sushruta's snake and scorpion remedies. Caius and Mhaskar have, however, shown experimentally that whether single or compounded it is not an antidote to either snake- or scorpion-venom.

Arabic: Kharkittan—; *Bengal*: Nai, Rasna—; *Bombay*: Rasna—; *Canarese*: Bandanike—; *Gujerati*: Rasno—; *Hindi*: Banda, Nai, Perasara, Persara, Rasna, Vanda—; *Marathi*: Rasna—; *Sanskrit*: Atirasa, Bhujangakshi, Chhatraki, Dronagandhika, Elaparni, Gandhanakuli, Muktarasa, Nakuleshta, Nakuli, Palankapa, Rasadhya, Rasana, Rasna, Rasya, Sarpagandha, Shreyasi, Sugandha, Sugandhimula, Surasa, Suvaha, Vandaka, Vriksharuha, Yuktarasa—; *Santal*: Darobanki—; *Telugu*: Chittiveduri, Kanapabadanika, Mardaru, Vadanika—; *Urdu*: Banda—.

Vanilla.

The genus consists of about 20 species; to be found in all tropical countries.

Vanilla planifolia Andrews and other species furnish the well-known vanilla pods of commerce, used as a flavouring ingredient and sometimes as a tonic, carminative and aphrodisiac. The pod of *V. planifolia* is official in the pharmacopoeias of Austria, France, Japan, Portugal, Switzerland and Turkey.

Vanilla griffithii Reichb. fil. is common in the forests of the Malay Peninsula and the Karimun isles.

The leaves and stem, which contain an irritating latex, are mashed and applied to the hair for strengthening it.

The flowers pounded with water are rubbed on the body for fever.

Malay: Akar punubal, Telinah kerbau bukit—,

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Zeuxine.

This genus numbers about 20 species, tropical Asiatic and African.

Zeuxine strateumatica Schlechter (=*Z. sulcata* Lindl.) is found throughout the greater part of India up to 5,000 ft. on the outer Himalayan ranges; it also occurs in the Malay Peninsula and Ceylon, and is distributed to Afghanistan, China, Japan, Java and the Philippine Islands.

The tubers are used as salep.

Bengal: Shwethuli—.

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BUTTERFLIES OF SECUNDERABAD.

BY

D. F. SANDERS.

I have read with interest the article, by Lt.-Col. W. E. M. Logan Home, published in volume xxxvii, No. 4, of the Society's *Journal*, on the Butterflies occurring in the neighbourhood of Secunderabad.

I collected in the neighbourhood from the Spring of 1927 to June 1929 and, while I can confirm that all the species mentioned by Col. Logan Home were found by me to occur there, I would mention that the following were also taken by me in and around Hyderabad (Deccan).

I found the best places to be gardens, European and Indian, mango topes, and low scrub jungle; also grass lands and the surroundings of cultivated land, especially where, as often in the Deccan, small outcrops of granite boulders occur, surrounded by a fringe of prickly pear, which the wandering herds of goats are unable to penetrate and the butterflies' food-plants, which are elsewhere largely destroyed by them, are thus able to survive.

Another good place was the compound of the Imperial Bank of India at Hyderabad, which, in addition to a large garden, contained several acres of waste land with a plantation of toddy-palms; several species seemed to have made this land their habitat, owing to the fondness of the imagines for the toddy extracted from the trees, and by smearing the trunks of these trees with a mixture of toddy and gur, I was able to attract a fair number of species which were otherwise seldom seen.

My collecting was necessarily confined to this compound, except for occasional Sunday and holiday mornings, but I believe that I succeeded in securing all the species available in the District.

Additions to Col. Logan Home's List of the Butterflies of Secunderabad and the District.

A. PAPILIONIDÆ.

Chilasa clytia clytia *var.* dissimilis. Very rare.

Papilio crino. Very rare.

Pathysa nomius nomius. Very rare.

Zetides agamemnon menides. Common in February and March and again during the monsoon.

B. PIERIDÆ.

Leptosia nina nina. Not rare.

Delias hyparete ethire. This butterfly appears to get up *very* early in the morning and to spend its day flying around, or resting on, the tops of high trees. The few I caught were mostly taken in the evening, when the butterfly

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comes down to settle for the night. Rare. (This appears to be the first record of this insect occurring in the central parts of Southern India.)

Appias libythea libythea. Very rare.

,, **albina darada.** I only found two or three, in November 1928, in the Bank garden and saw no others elsewhere then or at any other time. Very rare.

Catopsilia florella gnoma. Very common.

Eurema laeta laeta. Very common, in all seasonal forms, especially on grass lands.

Colotis amata modesta. Not rare.

,, **eucharis.** Common.

Hebomoia glaucippe australis. I only saw two, flying fast and high, which I was unable to catch, but they were unmistakable. Very rare.

C. Danaidæ.

Danais aglea aglea. Very rare.

Euploea coreta coreta. Rare.

,, **crassa kollari.** Very rare.

D. Satyridæ.

Mycalesis perseus typhlus. Not rare.

,, **visala visala.** Very rare.

Lethe rohria nilgiriensis. Rare. I caught a fair number at my toddy mixture otherwise seldom seen.

Orsotrioena medus medus. Very rare. This appears to be the first record of the occurrence of this insect from further south than the Central Provinces, from which Bingham records it.

Elymnias hypermnestra undularis. Very rare. Taken in the Bank garden in Spring. Bingham records this insect from Central India, though according to Evans it would not appear to occur south of Bengal.

F. Nymphalidæ.

Charaxes polyxena imna. Very rare. One male and one female only taken at my toddy mixture.

Euthalia garuda meridionalis. Very rare. Seen occasionally in gardens and mango topes, but the specimens I succeeded in catching were in such a bad condition that it was impossible to judge whether they were race 'meridionalis', or, as I believe, race 'anagama'.

Liminitis procris calidasa. Very rare.

Pantoporia perius. Very rare.

Neptis columella nilgirica. Rare; only seen in February and March.

,, **hordonia hordonia.** Very rare.

Byblia ilithyia. Not rare, but very local. Occurs wherever its food plant is found, on the edges of cultivated land and on grass lands, in the Spring and again during the monsoon.

Ergolis merione merione. Very common, especially wherever Castor Seed crops are grown. Came to the toddy mixture.

G. Erycinidæ.

Abisara echerius suffusa. Very rare,

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H. Lycaenidæ.

Talicada nyseus nyseus. Rare.

Tarucus ? . Common enough, but as, when I collected, I was unaware of the division of 'Theophrastus' into several distinct species, I cannot hazard an opinion as to which species occur.

Azanus ubaldus. Common.

,, **uranus.** Common.

,, **jesous gamra.** Rare and very local.

Everes parrhasius parrhasius. Very rare.

Lycænopsis puspa gisca. Very rare.

Chilades laius laius. Common.

Zizeeria maha ossa. Not rare.

,, **gaika.** Common.

Euchrysops cnejus. Common.

,, **pandava pandava.** Common.

Jamides alecto eurysaces. Very rare.

Loxura atymnus atymnus. Very rare.

Tajuria cippus cippus. Very rare. I never saw one flying, but a servant caught one in the Bank garden, and brought it to me fresh, but covered with finger-prints.

Virachola isocrates. Common; the larvæ could always be found, in numbers, at suitable seasons of the year, in pomegranates.

The following, included in Col. Logan Home's list, were found at the toddy mixture spread on the toddy-palms:—

Lethe europa ragalva.

Melanitis leda ismene.

Charaxes fabius fabius. This insect appeared to be very rare but I succeeded in catching large quantities of both sexes on the toddy mixture; they were most greedy and aggressive, fighting for favourable places, and were so occupied in their absorption that they could often be taken by hand.

Eriboea athamas agrarius. These were nothing like so common or greedy as 'fabius'.

Euthalia nais. These were obviously attracted by the good smell of the toddy mixture, but I never found them actually drinking; instead, they used to sit about on the ground some distance from the trees treated with the mixture.

Neptis hylas varmona.

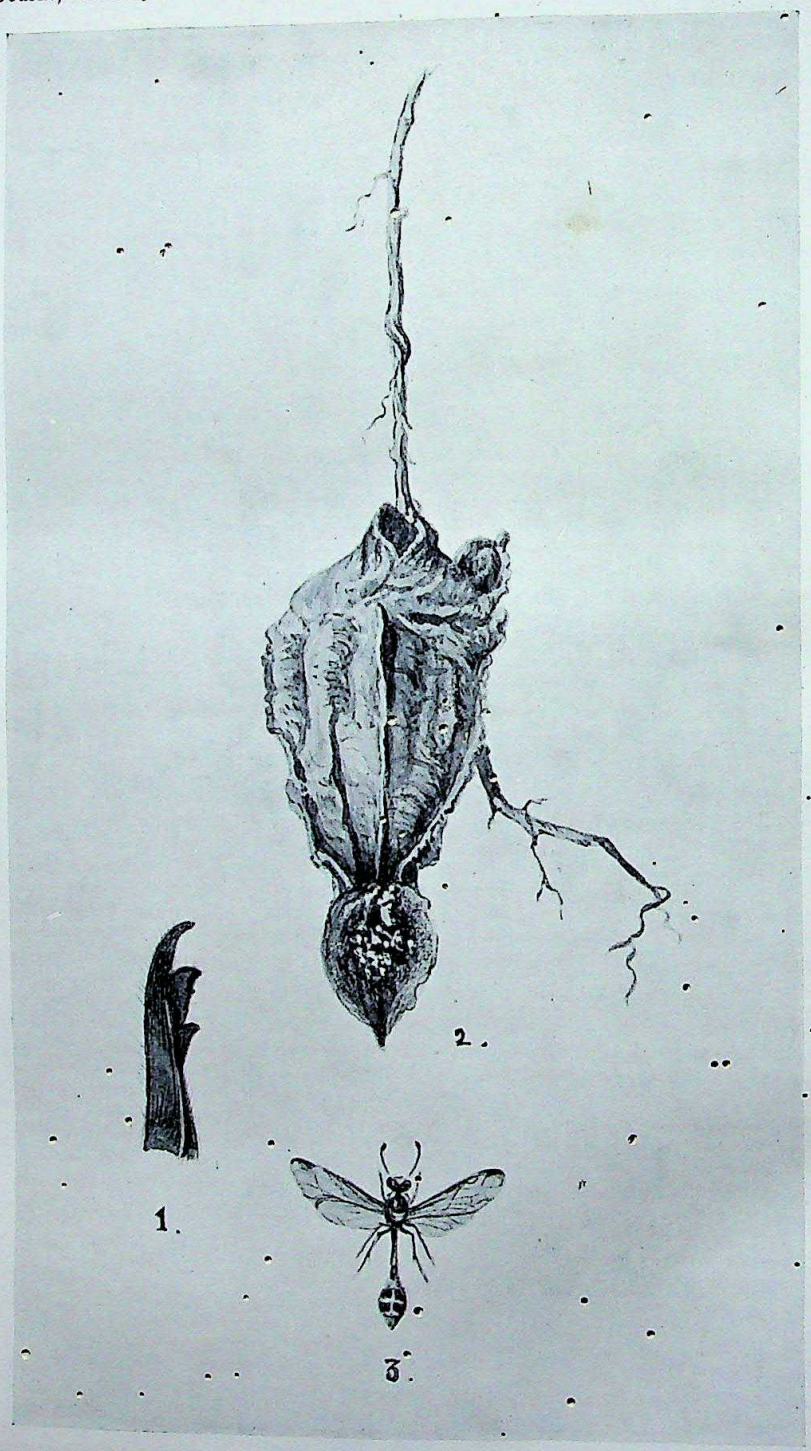
Ergolis ariadne indica.

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PARAVESPA EVA.
Fig. 1, mandible; fig. 2, nest; fig. 3, ♀ imago.

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A DESCRIPTION OF A NEW SPECIES OF WASP ASSUMED TO BELONG TO THE FAMILY *VESPIDAE* AND NAMED *PARAVESPA EVA;* WITH REMARKS UPON ITS AFFINITIES WITH THE GENUS *ISCHNOGASTER* AND REASONS FOR THE CREATION OF THE NEW GENUS *PARAVESPA*.

BY

T. R. Bell, C.I.E., I.F.S. (*retired*).

(*With a plate*).

Paravespa eva.

♀. Head, thorax, abdomen, including petiole, thinly pubescent, the pubescence longest on thorax and last three segments of abdomen and more or less golden on the last three segments, brown or silvery everywhere; head, pro- and meso-notum, scutellum, postscutellum and median segment very minutely punctured; clypeus very long, pointed, anteriorly carinated down the middle; median segment vertical, very obscurely rounded—carinate in anterior half along dorsal line, with a thin, also somewhat obscure furrow in continuation, in posterior half. Colour black with the middle third of petiole above and more extensively beneath ferruginous, the legs also having a ferruginous shade though otherwise black and the last three segments of abdomen being also light rusty; mandibles black, strongly three-toothed (see fig. 1 of plate), the ends of these teeth slightly ferruginous; antennæ black with stipes and last segment ferruginous; distal end of clypeus black, the rest as far as base of antennæ and the eye-sinus yellow; tegulæ dark brown; the following yellow markings; scutellum yellow except for a thin dorsal line and narrowish hinder margin (which are black); a thin band along front margin of postscutellum occupying about half the breadth of segment; a broad stripe on each side of median segment, a broad stripe on posterior margin of pronotum, a spot beneath each wing with a larger, lunulate one below that; the base of the second segment of abdomen broadly, the third segment similarly but more narrowly banded along front margin, this band interrupted in dorsal line and the fourth segment similar to third but the yellow hardly visible because of being telescoped into third; ventrally there is a small spot on each side of medial line near the middle of segment 2 and a large spot larterally near front margin of segment 3 that looks like a continuation of the band along its dorsal front margin; the yellow front of segment 2 is produced laterally backwards to make a spot symmetrical with this last; the tibiæ of legs dorsally yellow. Wings hyaline with a very slight yellowish or brownish shade, the whole of the radial cell very dark, nearly black, suffused downwards to fill the outermost cubital cell.

♂. Exactly similar to the female except that there are seven abdominal segments instead of six (including the petiole) and the terminal joint of the antennæ is strongly suffused with black.

Habitat.—N. Kanara District, Bombay. ♂♀. *Length* 20 mm. and slightly over; especially up to 33 mm.

In Bingham's *Hymenoptera*, vol. i, p. 377 of the *Fauna of British India* series, this species would come in under division A as follows:—

A. Colours black with yellow or red markings.
  a. Head and thorax black with yellow markings.
    a′. Clypeus yellow with an irregular medial space black, not reaching its apex; median segment with a reversed T-shaped yellow mark on each side ... *micans*.
    b′. Clypeus yellow without black medial space, median segment with a yellow spot on each side at apex. *fraterna*.
    c′. Clypeus black with small central yellow spot; median segment immaculate black ... ... *scitula*.
    d′. Clypeus yellow, except for a broadish black border reaching from apex to eye on each side, including apex; median segment with yellow, broad lateral stripe on each side ... ... *eva*.
  b. Head and thorax black with red markings ... ... *rufomaculata*.

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B. Colours rufescent brown or ferruginous with yellow markings.
   a. Median segment very finely transversely striate ... *nigrifrons*.
   b. Median segment smooth.
      a'. Median segment with vertically impressed medial line; length 12 mm. ... ... *nitidipennis*.
      b'. Median segment smooth throughout; length 18 mm. *eximia*.

As far as we are aware, *I. eva* is the only species of the genus that exists in India proper with the exception of Sikkim and its neighbourhood: *micans* reaching from Sikkim through Burma to Borneo; *scitula* from Sikkim to Assam; *fraterna, rufomaculata, nigrifrons* and *nitidipennis* are found in Tenasserim in Burma and *eximia* is confined to Ceylon. *Eva* so far is only known from the Kanara District in the Bombay Presidency where it apparently keeps to the forest-clad hills of the Western Ghats. It is there found from practically sea-level up to the tops of the hills which, however, do not reach to more than 2,600 ft. except for two small areas where a peak runs up to, at the most, 3,500 ft.

The wasp builds an absolutely unique pattern of mud nest very similar to that of *Ischnogaster eximia*, Bingham, first collected by E. E. Green in Ceylon and described by Colonel Bingham in the *Journal of the Bombay Natural History Society*, vol. v, p. 244, with an accompanying plate depicting, fig. 7, the nest. The description is repeated in Bingham's *Hymenoptera*, vol. i, p. 377, published seven years later in 1897. When I originally discovered my species in Kanara, I recognised it must be either the same as Bingham's or very closely related to it. His is 'dark rufo-ferruginous', mine is black and both have very similar yellow markings. His *eximia* has 'mandibles simple' and unidentate claws, both characters that make it abnormal for the family *Vespidæ*, but normal for its first genus *Ischnogaster* (itself abnormal for the family in possessing dentate claws). My species is abnormal for the family in the one character of the dentate claws and for the genus *Ischnogaster* in having the mandibles toothed as in the family. I met Colonel Bingham in 1908 in London and showed him my wasp and the plate accompanying this article (depicting fig. 1 the mandible, fig. 2 the nest and fig. 3 the imago) and, notwithstanding that I pointed out to him that my insect had *toothed* mandibles, he said it was *eximia*, ignoring this character and the difference in colour. It struck me from what he said that he thought he might possibly have made a mistake in describing the mandible of his species as 'simple'. Naturally I thought that Colonel Bingham must be right and from that day to this my specimens have lain in my collections unnoticed until this year (1935). For reasons given above I now know that my wasp is not *eximia* but differs from it in many characters other than colour and mandibles as may be seen by anybody taking the trouble to compare the two descriptions. I have just lately, within the last two months, December and January, collected some 13 or 14 specimens in the imago—and pupal state and three pupæ have produced imagines in the bungalow from nests collected outside—there are still some pupæ left to yield wasps. A Mantis, *Gongylus gongyloides*, kept in one of the cages with a nest, killed and demolished one imago without my being able to rescue it.

The nest is one of the most graceful bits of architecture conceivable, light as a feather and excessively fragile, built by the insect, small particle by particle of earth, brought on the wing and mixed with glutinous saliva to ensure adherence. It is invariably attached by the upper end to a dry and often nearly rotten rootlet hanging from the roof of a cavity in a bank in the jungles. When completed it hangs quite free and is never less than a couple of feet off the ground beneath. It resembles in shape an inverted pear with a lowly conical top and a cylindrical end that forms the entrance to the abode. The junction of sides with the roof is more or less angular but the other contours are gracefully rounded. The roof is low conical with the slope at an angle of about 45°, the bottom is a short tube made of little earth-pellets with interstices to resemble filigree work and the entrance at the bottom is ornamented, further, with an expansion, executed so as to resemble the distal half of a pointed leaf, extending well beyond the tube and as long as it is wide, embracing with its base the actual entrance-hole—a sort of platform for the insect to land upon when it arrives home. This

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structure is further ornamented with a dozen low, rounded, longitudinal flutings extending the whole length and each alternate fluting has a lowly prominent ridge down its middle which is expanded outwards to a height of about 5 mm. into a thin triangular wing, deepest above in the horizontal plane of junction of sides with roof, about 10 mm. long, losing itself gradually in its ridge below; occasionally the wing on a particular ridge may be omitted and, as an expression of the exuberance of fancy animating a particular architect, there may be an extra wing, along one of the ridges continued onto the roof near the point of attachment. Inside this wonderful house are the cells, all built in a single series on the roof, all perfectly hexagonal, one against the other, 5 mm. in diameter by about 14 mm. in depth with very thin walls and well-smoothed interiors. All a truly wonderful piece of handiwork no parallel to which I have ever seen elsewhere. The nest resembles a delicate reproduction of a shell of the genus *Voluta* amongst the mussels. It also reminds one of a suspended bat when placed in a darkish corner and real bats are common enough in such places. The flutings on the outside correspond at their origin to the contours of the outer row of cells inside.

The largest nest I found was 80 mm. by 60 mm. over all, the entrance tube with its expansion taking up 20 mm. of the former while the prominence of the wings when existing is not included in the 60 mm. The diameter of the filigree tube is 10 mm., its length about the same. The smallest nest measured rather under 60 mm. by 40 mm. and contained only 14 cells. In the larger ones there are up to 21 cells and those forming the outer row appear always to be 12 in number which explains the number of the longitudinal flutings always present on the outside of the structure. The cells that have been inhabited can always be recognised by their mouths bearing remains of the covering (only a partial affair as a round aperture is always left in the centre) woven by the larva or grub when it 'spins' itself up before turning into the pupa. I have never found more than five of these used cells in any nest, new or old and, including all found, that means at least a couple of dozen examples. The wasps from one nest emerge at intervals of at least a week, often much longer. The building up of the entrance is presumably necessary to hold the pupa in place as, naturally, the cells being on the roof of the nest, these pupæ all lie with the head downwards. The head is held so that the face lies against the side of the nest, the abdomen is folded in against the sternum of the petiole and median segment and the cell opening is of much smaller diameter than the head and thorax.

Kanara is on the Western Ghats about 15° north of the equator and has, at Karwar, a yearly rainfall of 125 in. Inland, towards the crest of the Ghats, this may rise to 350 in. in certain places; in exceptional years it may even go to 450 in. and above and 150 in. on the sea-coast. The wet zone does not extend to more than at the outside 60 miles inland after which the rainfall rapidly diminishes eastward. At 60 miles inland it is, say, about 80 in., at 80 miles it is not over 25 in. The vegetation is Malayan in type in the wet parts, eastward it is all Deccan flora which means that the Ghats are largely covered with evergreen forests, the eastern country with deciduous species. The whole district is fully 85 per cent forest.

The insect under consideration is found only in the damper areas and the places where it first came to notice were cuttings in the sides of roads which were excavated to get the earth for annual repairs to their surfaces. Many of these are quite deep and shaped like the commencement of burrows and it was on the roofs of these that nests were originally discovered; the inhabiting wasps were at first only recognized as the architects of a beautiful mud nest. Later on specimens were collected and kept as adjuncts to the nest. That was forty years ago. There are many fine roads in Kanara running from the sea-board through the Ghats to the Deccan so that there was no lack of hunting ground in which nests could always be found; but, of course there are plenty of natural hollows in banks inside the jungles that are also used as building-sites. The particular requisites in the choice of a spot for the wasp seem to be a certain degree of humidity, absence of direct sunlight and a suitable 'roof' with rootlets hanging from it.

In no case has there been more than a single nest in any one cutting. In no case have there been more than three wasps in and around any nest and,

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in the single case of three, one insect had certainly only just been born. In no case have any of the wasps caught 'wild' (which means at nests in the jungles) been other than female. In the last batch of insects obtained wild or bred in the bungalow from nests brought home there has not been one of the male sex.[1] I conclude from this that the male does not assist in the construction of the home, neither does he ordinarily help in domestic affairs any more than do the solitary wasps of the family *Eumenidæ* immediately preceding these *Vespidæ*. These two species *eva* and (by general analogy, it is nearly certain) Bingham's *eximia* are, to all intents and purposes, 'solitary' wasps like the *Eumenidæ* and, although more like *Vespidæ* in most respects, they constitute a link between the two families abnormal in possessing characters of more than generic value differentiating them from both. Bingham mentions this in the case of his *eximia* and, in another way, for the whole genus *Ischnogaster*. This genus is abnormal for the *Vespidæ* in that it possesses dentate claws (the family has simple ones).

I think the best way out of the difficulty would be, to obviate the necessity of making a new family for the exceptions, to divide the family *Vespidæ* into two sections:—

1. The perfectly normal insects.
2. The insects that are abnormal in one or more characters.

Under 2 would come the genus *Ischnogaster* and the two species *Eva* and *eximia* for which I suggest a new genus to be called *Paravespa*, as follows:—

Insects with unidentate claws, normal mandibles and of normal social habit	*Ischnogaster.*
Insects with unidentate claws, mandibles simple or normal (toothed) and of solitary habit	*Paravespa.*
Mandibles normal, claws abnormal for family ...	sp. *eva.*
Mandibles abnormal as well as claws	sp. *eximia.*

As a matter of fact these two wasps with their equivocal characters outlawing them from any existing family, should have had a family of their own, but one hesitates in introducing such a thing into the old and well established hierarchy of tribes, families and genera of the *Hymenoptera* we have been accustomed to recognise and work with for so long in the past.

The *Paravespa* wasp starts building operations at the commencement of the monsoon, in June in Kanara and goes on until about the end of January next with a lull in the months of February to next June necessitated, I have little doubt, by the lack of moisture in the air and paucity of prey and pabulum; probably chawed-up caterpillars. The new-born wasps, bred in captivity, spend a day or two after emergence in the nest and are very sluggish when they come into the open and, without food, only live for a day or two; when fed with sugar they live but a short day longer.

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[1] It was only after I had written the above that I bred two males from nests; the total number of wasps caught at nests and bred from them was 15; none of those caught at them were males.

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REVIEWS.

1. MAN: A SPECIAL CREATION. By Douglas Dewar, B.A. (Cantab.), F.Z.S. (Thynne & Co., Ltd., London, 3/6).

This little volume (pp. 123), like many others of its kind which have appeared from time to time since the publication of Darwin's *Origin of Species* and *Descent of Man*, has the definite purpose of questioning the validity of the theory of organic evolution in general and of Man's animal descent in particular, and of asserting that all the varied forms of life including Man were created by a special act of God in the not very remote past. Within the limits of space available for a review, it is impossible to deal adequately with all the arguments advanced by the author against the theory of organic evolution, and in consequence, the review is mainly confined to a summary of the work.

This little book is divided into six chapters. In the first the author points out that modern scientific classification compares very unfavourably with that adopted in the Book of Genesis in regard to the position of Man in the animal kingdom, and believes that scientists have purposely ignored certain anatomical and mental characters of Man which militate against the acceptance of the theory of Man's primate ancestry. In the next two chapters the author goes on to show that Man's descent from a non-human ancestor has not been proved, and that all the evidence brought forward to prove this theory makes undue demands on the credulity of most intelligent men with a legal as well as a scientific training. The claim of the evolutionists that the difference between the brain of Man and that of the ape is one of degree and not of kind is not accepted, and the evolutionists are challenged to produce by selective breeding of monkeys 'an intellectual giant among its fellows' if the creationists are to be satisfied. The existence of divergent opinions in regard to the descent of Man from an ape-like or other ancestor is attributed 'to the fact that there is no evidence to go upon'. In the third chapter the author examines the various theories held in regard to the origin of human language, to the anatomical peculiarities of Man such as the upright posture and the bipedal gait, and to the psychic gulf that exists between Man and the rest of creation. In the fourth chapter, which is the longest, a great deal of criticism is levelled against Darwin, and against the indirect evidence he and his followers put forward in support of the theory of Man's animal descent. The insufficiency of the evidence adduced is examined under five headings viz.: (1) the anatomical and physiological resemblances between Man and the Primates; (2) the method of Man's embryonic development; (3) the vestigial organs in Man; (4) the supposed reversions of human organs to an ancestral state; and (5) the blood serum reactions of Man. After a lengthy but unconvincing discussion of the topics under each of these headings, the author concludes that the indirect evidence adduced in support of the theory of Man's animal descent is exceedingly weak, and is not opposed to the theory that Man is a special creation. The fifth chapter is devoted to the examination of the causes which led to the wide and ready acceptance of the theory of Man's animal descent, amongst which may be mentioned (1) that amusement is derived by the average biologist in solving the biological cross-word puzzles of the theory of evolution; (2) that the theory of evolution is the life-blood of the rationalists and the materialists; (3) that the literary skill and persuasiveness of the supporters of the theory in expounding it to the public were responsible for the popularity of their views. What surprises and pains the author most is the fact that eminent men, scientists to boot, who have been most vehement in attacking the mode of operation of the theory as propounded by Darwin and his followers have retained their belief in evolution as a settled fact. He is, however, satisfied that the recent Evolution Protest Movement under the leadership of Capt. B. Acworth and Sir Ambrose Fleming will not make it easy for weak-kneed protestants to succumb to the casuistry of the clever evolutionists. In the last chapter the author reiterates that the evolutionists have failed to produce demonstrable evidence from the study

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of fossils and from experiments in breeding to prove to the satisfaction of the creationists that Man originated by a process of evolution. The evidence which he brings forward to prove the theory of man as a special creation is classed as scientific, under the headings—anatomical, psychological, palæontological, and biblical, but none of these are elaborated to show clearly that Man cannot be included in the general scheme of evolution of all living things. There is much irrelevant matter included in this chapter as for instance, amongst others, the accusation levelled against H. G. Wells as a plagiarist by a contemporary woman author.

The book is, however, well worth a perusal as both the matter and manner of presentation are interesting. The printing and get-up is good, and a glossary at the end helps the lay reader to understand the technical terms.

H. S. R.

II. GLIMPSES OF THE WILD. By Lt.-Col. H. S. Wood, I.M.S. Pp. 180; with colour and monochrome plates. London, H. F. & G. Witherby, 1936. Price, 8*s*. 6*d*.

Lovers of nature and newcomers to India will delight in the reading of *Glimpses of the Wild* in which Lt.-Col. Wood deals with the more common denizens of Indian rivers, hills and forests: animals, birds, reptiles and insects—not all of them, but those he has come to know or even to befriend in his rambles. The author's style is simple and pleasant; his descriptions are not crowded with useless details; and his selection of illustrations is excellent. In fine, a very readable and attractive book.

Old timers may be to some extent disappointed for, somehow, they will all along carry the impression that they have heard the story before. As for the men of science they will, no doubt, be horrified at some of the phrases and statements. But, before passing any adverse criticism, let them remember that the book has been written by a 'non-scientific observer' (p. 179) and is intended for 'young naturalists' and for 'those who visit India for the first time' (Preface).

J. F. C.

III. A SHELLAC PATENT INDEX. By R. W. Aldis. Pp. iv+115. Indian Lac Research Institute; Namkum, Ranchi, Bihar and Orissa, India; August 1935. Price, Rs. 2-8.

This valuable compilation ought to be in the hands of every one interested in the manufacture and uses of shellac and its synthetic rivals.

The author is to be congratulated; but not so the binder.

J. F. C.

IV. WILD ANIMALS OF THE INDIAN EMPIRE AND THE PROBLEM OF THEIR PRESERVATION. By the Bombay Natural History Society. With coloured and black-and-white illustrations (Diocesan Press, Madras). Price, Rs. 2 per part.

Having gone through the four parts of the *Wild Animals of the Indian Empire and the Problem of their Preservation* published by the Bombay Natural History Society, I feel that all the Naturalists and Sportsmen in India are under a heavy debt of obligation to the Society for this fine work. The problem of the preservation of wild life in a country like ours is complicated by the fact that the average man takes little or no interest in Natural History. Hence it is very pleasing to see that in these books, before the problem of preservation is discussed, a full account of the Wild Mammalia is given, calculated to generate and foster an abiding interest in them. The value and the importance of the work is greatly enhanced by the many beautiful plates which are included in these volumes.

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Whenever the need for the protection of Wild Life is mentioned, it is customary for people to look to Government legislation and enforcements. But before any Government legislation can be enacted and successfully carried we have to remember two important facts:—

Firstly, most modern governments appear to be unwilling to bring into legislation any subject which is not supported and demanded by a strong public opinion.

Secondly, even if such a legislation has been effected, however much it can and may help in the endeavour, anything like practical success is possible only if there is a strong public opinion demanding it and co-operating with Government.

For this end, viz., the formation, development, and strengthening of public opinion looking upon wild life with interest, sympathy and a fair amount of knowledge, these four delightful volumes are, I believe, well suited.

These well-got-up volumes, each I believe sold by the Society for the very nominal price of Rs. 2 which must be only a small part of the actual cost of production, should be a cherished and proud possession in every cultured Indian home to tell us of our forest denizens, and to make us love them. Loving them, much of that indifferent callousness and hatred begat of selfishness, greed and ignorance, will, I trust, disappear.

I wish these Volumes wide popularity and great usefulness in serving the purpose for which they have been conceived and intended.

A. P. M.

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AN APPEAL.

WANTED INFORMATION ABOUT CUCKOOS.

To the Editors,

The Journal of the Bombay Natural History Society.

Dear Sirs,

I am hoping within the next few months to commence a book on Cuckoo problems, a subject in which I have been interested for more than 50 years, in spite of which I find that there is still an extraordinary lack of evidence on many material, yet in some cases, simple points. May I hope for help from our readers?

Here are a few of the points which still require elucidation in whole or part:—

Desertion of nests in which cuckoos' eggs have been deposited.

Ejection of cuckoos' eggs from the nests of the foster-parents.

These are simple points, yet not easy to generalize on from the evidence so far in existence. Most of us find our nests when the owners leave them and so disclose their whereabouts; if deserted there is no owner to leave and the whereabouts are not disclosed. Simple questions, yet very difficult to answer satisfactorily.

Extent of habit of ejection. We know that all species of *Cuculus* have this habit. We also know that some species of *Clamator* do not eject eggs of the foster-parent or their young. We do not, however, know yet to what extent *Hierococcyx*, *Penthoceryx*, *Cacomantis* and other genera have or have not this habit. We do not even know to what extent the Koel has it, *if at all.* Nor have I been able to ascertain whether the newly hatched young of all these species possess the physical attributes (hollowed back, etc.) which would enable them to practise this habit. It would surely be easy to ascertain if the young of the Koel, the Brain-fever Bird (*H. varius*) or *Clamator jacobinus* possess the hollow back.

Rearing of multiple young. Mr. A. J. Cronil has published a few notes on this matter, and a few others are scattered here and there in journals and elsewhere; but still comparatively little is recorded. Does, or can, a pair of 'Seven Sisters' bring up more than one young Hawk Cuckoo and, if so, how many?

Deposition of eggs. It has been found that some cuckoos lay direct into nests and circumstantial evidence shows, and indeed proves conclusively, that many eggs are found in nests in which they cannot have been laid direct. Quaint methods of deposition have been suggested; and deposition has actually been described as having been effected by an elongated vagina working like an ovipositor, yet no dissection of the bird seems to have been made to expose the impossibility of this act.

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Much must have been done of which I am doubtless ignorant; but far more still remains to be done. I shall be very grateful for any notes and any material which may be sent me, and these will be acknowledged when received and, of course, in the book when and as they are made use of. Especially shall I be glad to receive eggs and full notes on the breeding of the Plaintive Cuckoos round Hyderabad in the Deccan.

Yours hopefully,

6, HARROLD ROAD,
UPPER NORWOOD, S.E. 19.
February 24, 1936.

E. C. STUART BAKER.

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MISCELLANEOUS NOTES.

I.—ROOSTS OF FLYING FOX.

While going through the past volumes of the *Journal*, I came across Mr. McCann's very instructive article on the Flying Fox (*Pteropus giganteus* Brünn), *J.B.N.H.S.*, vol. xxxvii, No. 1, p. 143. Among other things, he has recorded some colonies of this animal. In this connection, the undernoted information may be found useful.

(1) About 56 miles north of Ahmedabad, there is a town called Unjha (a Railway Station) in North Gujerat. On the outskirts of it, there are several Tamarind trees, which have been the abode of the Flying Fox for at least the last 30 years. The trees stand within the town, and nearby is a big tank, a scene of bustle and noise throughout the day. Still the bats occupy the trees year in and year out undisturbed. I have no knowledge whether the same animals have been living there or whether new-comers are added to the colony from time to time. But this much is certain, viz., that these trees are always occupied.

One thing in this connection puzzles me: the source of their food supply. There are no orchards here, nor are there any fruit-bearing trees. The whole country-side is pincipally an agricultural tract, interspersed with *Acacia* trees.

(2) Another colony I have found right in the city of Ahmedabad. There are several Tamarind trees in front of the Victoria Gardens, at the foot of the Ellis Bridge. Until a few years ago, one of these trees was the permanent residence of Flying Fox. I first saw them there in 1914 when I came to Ahmedabad. I cannot say how long they had occupied this tree previous to 1914. It took all the ingenuity of the municipal staff to remove them from their quarters. This was done in 1932, yet for eighteen years, to my knowledge—and how long before, I do not know—the bats lived in the heart of a big city, where noisy traffic passed under them throughout the day.

It is interesting to record that in an adjacent tree—also a Tamarind—there was a colony of Egrets living apparently on good terms with the bats. When the Flying Foxes were forced to vacate their home (the Egrets also went: where I cannot say). About a couple of hundred yards north of the Victoria Gardens, there are Government buildings occupied by the Court of the City First Class Magistrate. There are several trees in the compound

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of this court house, out of which eight are at present occupied by Flying Foxes. They comprise:

गू. पींपळो Pipal tree: *Ficus religiosa.*

,, पींपळ Pipal tree: *F. tsiela.*

,, लीमडो Nim tree: *Azadirachta indica.*

,, अरडूमो Heaven's tree: *Ailanthus excelsa.*

At Patan (North Gujerat), several trees—mostly Tamarind and Banyan—have been the abode of Flying Foxes for about 25 years.

Hibernation.—It is believed that the Indian Bats hibernate. This is not altogether correct—especially for North Gujerat bats. During the last three months I have daily found the cheerful Indian Pipistrelle (*V. abramus*) hawking insects from early evening in company with their inseparable friends—the swallows. But I thought that the case of the Flying Fox was different. I had, during December and January, several times visited the colony mentioned under item 2 above—as late as 11 p.m. and as early as 5 a.m. The animals were still there, wrapped up in their shrouds and sleeping undisturbed. They never appeared to leave the place nor were found arriving as they did in summer. Hence I concluded that at least these fruit-eating bats did hibernate in North Gujerat.

Now I find I was mistaken in this belief. Because, for the last six days, I see Flying Fox passing my window daily in the evening, going from west to east. They come incessantly for about thirty minutes in large numbers. Once I counted up to 200 and then lost the count. Whence they came and where they were going I cannot say. Also I am not in a position to say that they were the same as No. 2 colony above. But this at least shows that Flying Fox also comes out in winter.

NAVO VAS, DANAPITH,
AHMEDABAD.
January 31, 1936.

H. G. ACHARYA,
F.Z.S., F.R.G.S.

II.—MELANISM IN WILD DOGS.

Mr. V. G. Darrington, I.F.S., the District Forest Officer, Coimbatore North, saw a black wild dog at Gaddesal, in the North Coimbatore Division, on the 11th instant. With the exception of a white tip to its tail the dog appeared to be completely black and was unmistakably a wild dog. I wonder if an instance of such complete melanism in a wild dog has been recorded before.

HONNAMETTI ESTATE,
ATTIKAN P.O., *Via* MYSORE,
S. INDIA.
January 14, 1936.

R. C. MORRIS.

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III.—LEGENDARY METHOD OF HUNTING IN WILD DOGS.

As a pendant to Mr. Livesey's interesting note on the behaviour of the Indian Wild Dog (*J.B.N.H.S.*, vol. xxxvii, No. 2), I can confirm the belief among native villagers that these dogs make use of their urine to blind game they are hunting. I was most solemnly assured by one of my mahouts, when stationed at Baksa Duar, that these dogs urinated on their tails and then, running ahead of their quarry, flicked their tails towards the animal's face.

Also I was told, on several occasions, a habit of theirs which seems far more credible, and that is, when a pack arrives at a new hunting ground, its members go round the boundaries of the portion they mean to work, urinating at frequent intervals, because —so my informants told me—all wild animals, which the dogs hunt, are so terrified of the enemy that they will never cross a point where they can smell the taint of the dog's presence.

May I congratulate you on the continued excellence of the *Journal*? It is a quarter of a century since I left India, but I enjoy my *Journal* as much as ever I did when shooting, fishing, or egg-collecting in the country.

CATCOTT, *Near* BRIDGEWATER,
SOMERSET. ARUNDEL BEGBIE,
January 2, 1936. *Lt.-Col.*

IV.—SOUND LISTENING FOR TIGER SHOOTING.

INTRODUCTION.

It is with trepidation one ventures to put forward an article on tiger shooting as the subject has been so widely written upon by famous sportsmen. This article is only put forward to help the young and keen tiger 'shikari'; and my reason for doing so is due to a conversation I overheard the other day. I have heard so many similar remarks and pathetic descriptions of failure, through lack of knowledge. All the good books on tiger shooting give one full particulars of how to run a beat, but none that I have read give one advice of how to find out, as far as it is possible in this kind of sport, whether the tiger is really in the beat after he has killed the tie up. Hence my reasons for this article. I feel I must repeat the conversation before I get on with the meat of the article.

CONVERSATION.

'Raifal', a keen young 'shikari' back from a tiger shoot. 'Blanderbast' (known as *B.*) an old hand at the game.

B.—Well young man—What luck?

R.—None at all, had three kills—all in beatable places, no tiger in any of them.

B.—Dodged the stops or broke back?

R.—No, never in the beat at all. I am fed up as I spent a packet on beaters, shikaris, etc.

B.—Shikari venture any information for tiger not being in beats? Did he seem surprised when they did not appear?

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R.—No. Just said it was Kismet and that the Saheb was not liked by the Gods.

B.—What did he or you do to ascertain whether the tiger was in the beat before you had your beat?

R.—We walked round the beat to look for pug marks going in and out of the beat, but the ground was so hard and stoney that it was very difficult to see much.

B.—You did nothing more before beating to discover whether the tiger was there or not?

R.—No.

B.—Well, you did not do much and I am not surprised you have been unsuccessful.

The above makes one feel sorry for the youngster, as he is ignorant of a few hints which would have been very valuable to him, had he read them anywhere before going out and he would have felt that he had not wasted all his hard-earned savings on learnings and been disappointed.

Sound Listening.

Its object is to locate the tiger after he has killed near a beatable area. On hearing these words, one is apt to get alarmed and think that one has got to deal with complicated wireless apparatus, or some machine to discover the whereabouts of submarines, or some other fiendishly clever invention. Far from it. This scheme has only to do with human beings and is as simple as adding the proverbial 2 and 2. It is put forward because it is so simple, and with experience is found to be almost infallible.

Requirements.

Two men fairly intelligent in jungle lore, two pieces of cardboard from 6 to 10 inches square, two pencils and a ream of foolscap paper, two khaki drill bags to carry the pieces of cardboard in the forest, one cheap watch (this is not absolutely necessray, as Indians are fairly good about the time of the day).

Instruction.

Can start anywhere, in one's own bungalow, or while one is out in the forest. One point to remember is to choose men who are conversant with the different sounds made by the animals, and one can be assured that most of the jungle folk anywhere in India are good at this.

Choose a piece of ground representing a beat, with two trees somewhere near the base. Place your men with their backs against the trunks facing the direction of the line of advance of the beaters. This is not essential, but is only suggested for simplicity's sake. The men can be placed anywhere surrounding the beat. Put the foolscap paper on to the cardboard, give it to the men with pencils and make them face the direction of the beat. In the centre of the nearest edge of the paper draw a blob representing the tree, make the man set his paper. Inform him that in a certain direction a cheetal called at 11-00 a.m. Make him draw a ray in this direction and put down roughly how far away

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he thought it was. In practice the range has to be given. Other rays can be drawn in this manner. Explanation makes it clear that this is what they—the men—have to do after a kill has taken place. Each man works on his own as the Indian is rather apt to feel insulted if he realises that another man is doing his work. Also he is liable not to do the work when the opportunity arises. The final drawing is done by combining the two cards. The base of the triangle is known on account of it having been measured before, then where the rays on each card cross on the main card is the rough area in which the tiger has been located.

METHOD.

The object, as stated before, is to locate the tiger after he has killed. In order to put this plan into action one must have some sort of idea what are the habits of tiger. Roughly speaking, the habits of a tiger after he has killed are, drag the kill to some secluded spot, feed (depending on the time), move off to his drink, return and lie up somewhere near the kill if the jungle is good holding jungle, from where he can watch his kill and keep off all carrion.

In the hot weather the tiger seeks the cool and the shade and more often than not will lie in water during the hottest part of the day. He does not move about very much unless water is very near his kill in the heat of the day.

In the cold weather the forest is generally heavy with dew till late in the morning; and due to it being cold, the tiger meanders about for quite a while, even to the extent of climbing a hill near his kill to obtain the warmth of the sun. He generally returns when it gets hot and lies up in the cool and shade and somewhere near his kill if the forest is thick and not likely to be disturbed. It is during these movements that touch must be kept with the tiger, as he may very easily, like a defeated enemy in war, slip right away and not return to the beat. Thus this *sound listening* is strongly recommended. To put it into action.

One assumes that the beat has been reconnoitred beforehand. The tie up has been killed and dragged as far as can be ascertained in the direction of the beat. Do not let anybody follow the line of the drag. One can generally see which way the tiger has taken the tie up. The report reaches camp. The sound listeners, having fed, are taken out, shown the piece of ground placed in their respective trees with their apparatus, with full instructions and emphasis about no noise or talking. Any noise must be reported and the ray drawn. These men must stay in their places till one returns to beat, as information can be had up till the last minute and sometimes very valuable information. If there are several rays in each diagram, then one can be contented. If there are none, the best thing to do is to give up the idea of beating and return to the attack the next day, as it means that the tiger has taken up his abode somewhere else.

(I have assumed that there will be animals in the forest, and as one knows that when a tiger moves every animal and bird who smells or sees the tiger gives tongue to every sort of cry.)

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.CONCLUSION.

I trained some of my Regiment in the above work and they became so keen that in order to make no mistake each man bought a ruler on his own and produced drawings of the utmost accuracy. This is not necessary! Reports were always clear and I found that I saved a lot of money on beaters, and also what was more valuable, time. I think that I can honestly say that this method practically never failed. The tiger may have got away but this was the fault of the gun or stops and not of the sound listeners. I am a great believer in silent beats. By this I mean the beaters shout twice before they start beating, once to wake the tiger up and the other to get him moving. During the beat itself, tapping is the only noise one hears.

I realise that I am in for a lot of controversy, but am only too willing to answer any reasonable questions.

GOVERNMENT HOUSE,

BOMBAY. J. TOOGOOD,
February 9, 1936. *Lt.-Col.*

V.—MEASUREMENTS OF A BUFFALO-HEAD FROM ASSAM.

(*With a photo*).



The photograph above is the head of a bull buffalo I recently shot in the Mangaldai District of Assam, which possibly comes in the record class, and I should be grateful if you would advise me in the matter.

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The measurements, by steel tape, which have all been checked and witnessed, are as follows:—

Tip to tip across forehead	...	...	118½ in.
Right horn	...	...	53 in.
Left horn	...	...	48 in. (broken)
Maximum girth	...	...	23 in.
Maximum spread	...	...	46 in.
Height at shoulder	...	...	6 in.

You will observe that the maximum spread is very small indeed, but the girth as far as I am able to trace appears to be a record. Unfortunately, I cannot get hold of the latest edition of Messrs. Rowland Ward's *Records of Big Game* to compare these measurements.

If the left horn had not been broken, the tip to tip measurement would have been approximately 123 in., and this seems to be a fine head for these days.

It may interest you to know that this buffalo was with a herd of eleven cows some miles from any reserve, had killed three men and badly injured a boy within recent months and was said to have been 29 years old.

CALCUTTA. R. G. GRIFFITH.
April 1, 1936.

[The Record head of the Indian Buffalo has a horn length of 77¾ in. and a girth 17⅞ in. This is the head of a female now in the British Museum. The largest recorded head from Assam (Rowland Ward) has a horn length of 70 in.; circumference 18½ in.; widest span between horns 67¾ in.; tip to tip 60 in.; widest outside 72 in. The maximum girth measurement so far recorded for the horns of a Buffalo is 22 in. This of a head with 60 in. horns. Shot in the Central Provinces.—EDS.].

VI.—BISON AND PANTHER.

A rather interesting incident occurred last night while I was sitting up over a panther kill with Col. R. P. Warwell. A herd of bison happened to come grazing along while the panther was feeding on its kill. As soon as the bison scented the panther the herd commenced to converge slowly on the kill in a rough half-moon formation snorting and bellowing. Had I been alone I should have waited to see the outcome but my guest wanted a panther badly and shot it before the panther had even time to show signs of uneasiness. The bison did not seem to be much disturbed at the shot and remained around in the vicinity for some time.

HONNAMETTI ESTATE,
ATTIKAN P.O., *Via* MYSORE,
S. INDIA. R. C. MORRIS.
January 15, 1936.

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VII.—GAUR-HEADS FROM THE CHIN HILLS.

(*With a photo*).

It is generally believed that you must have a 'cordite cannon' to shoot bison with. But this photograph from south of Haka in the Chin Hills shows what magnificent beasts have fallen to the humble flint-lock with soft lead bullets and home-made black powder.



A SPORTSMAN IN THE CHIN HILLS—MAGNIFICENT BISON HEADS SHOT WITH A FLINT-LOCK!

All heads are over 40 inches. The widest is 46 inches and the longest round the horn 37 inches.

All four heads are well over 40 in. in span, and the second from the right was 46 in. across. The second from the left measured 37 in. along the outer curve of each horn. All were of great girth.

Nowadays such great heads are rare in Burma when yearly guns increase and game decreases.

Then huge, slab-sided cattle are vulnerable to almost any weapon if taken through the heart from the flank and the great bones and muscles avoided.

A Chin Chief stands to his trophies as he did in the chase—a fearless and a perfect gentleman.

TAUNGGYI,
BURMA.
March 6, 1936.

T. R. LIVESEY.

VIII.—SEASON OF HORN DEVELOPMENT IN SAMBHUR.

Mr. A. A. Dunbar Brander writing on sambhur in his *Wild Animals in Central India* mentions that he had never heard of sambhur being in full horn in August or September.

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In 1933 I shot a stag in full horn in September and saw another. This year, a large number of stags in this District (the Billigirirangans) were in hard horn during the second half of August and in September. Mr. H. G. M. Dunn, R.A., shot in the first week of September a fine stag which had certainly been in full horn during the latter part of August. This has been followed by a very early shedding of antlers in February this year instead of March and April as is usually the case.

HONNAMETTI ESTATE,
ATTIKAN P.O., *Via* MYSORE,
S. INDIA.
March 30, 1936.

R. C. MORRIS,
F.Z.S., F.R.G.S.

IX.—'CUCKOO-LORE'.

1. In Lt-Col. R. W. Burton's article on this subject there are certain statements which require qualification. 'Sometimes when the nest is large enough and favourably situated she will lay her egg in it, but in probably the large majority of cases she lays her egg on the ground and introduces it by her bill into the nest.' (*J.B.N.H.S.*, vol. xxxviii, p. 268.)

Most field-workers, finding cuckoos' eggs in small and awkwardly placed nests, especially those in which the hole is at the side, have inferred that the egg must have been introduced by the bill. Mr. E. P. Chance, Captain O. G. Pike, Mr. Scholey and I myself, all formerly shared this view. Yet at the present time, all of us are agreed that in every case where it has been possible to observe accurately and closely the cuckoo has laid her egg directly into the nest.

In many cases there is little doubt that when the cuckoo has been seen on the ground apparently picking up an egg, she has in reality been devouring an egg taken from the fosterer's nest. I do not know and have never heard of a case when it has been proved conclusively that the cuckoo's egg was first laid on the ground and afterwards introduced into the nest by the bill. On the other hand she has been photographed and even filmed in the act of laying, not only in the nests on the ground, but even in that of the Reed-Warbler, which would seem at first sight to be too small for the cuckoo to lay directly into it.

The fact is that the cuckoo can cling to the side of a nest just as a woodpecker clings to the side of a tree, and in that position can bring the cloaca opposite to the entrance of the nest and eject the egg so that it rolls down among those of the foster-parent.

Nests of the Wren frequently bear traces of the damage done to the upper part of the nest while the female is positioning herself for oviposition and several cases are on record where the

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egg has not rolled into the nest, but has fallen to the ground. This could hardly happen if the egg had been placed in the nest by the parent's bill.

It is not *impossible* that the method which Lt.-Col Burton describes as being adopted in the majority of cases may also be used, but the fact remains that so far we lack conclusive proof of it.

'On rare occasions the mother has been observed to feed its own young: while there is one reported instance of the common cuckoo hatching its own eggs and rearing the young.' (p. 268.)

The evidence of the hen cuckoo feeding her young is quite unconvincing: moreover other species besides the actual fosterers have been known to supply food to a hungry youngster. As for the story of the cuckoo hatching its own eggs, this was published over forty years ago in a popular German paper. It was at once challenged and disproved on internal evidence and has never been accepted in the country of its origin, but was unfortunately translated and republished in England and has been quoted several times since as authentic, although known to all ornithologists as being quite unreliable.

The proportion of eggs which resemble those of the fosterer is extremely high in those districts where the cuckoo is parasitic on one or two species only. In certain districts however where four or five common fosterers are present a 'mixed' type occurs, in which resemblance is less close—I do not find any discrepancy between the views of Mr. Stuart Baker and Dr. Rensch. The adaptation of the cuckoo's eggs spoken of by the former is carried out by elimination of unsuitable eggs by the fosterer, not by any action on the part of the cuckoo.

WHITEKIRK,
SOUTHBORNE, F. C. R. JOURDAIN.
BOURNEMOUTH.
January 1936.

2. Naturalists will be grateful to Col. R. W. Burton for his very interesting collection of Cuckoo-Lore recently published in the *Journal* (vol. xxxviii, p. 266).

Considering the number of parasitic cuckoos in the Indian region it is surprising to see how little has been recorded about them except for the valuable contributions of Mr. Stuart Baker. It shows how real Ornithology has been neglected.

Col. Burton's article provokes interest—and so, of course, comment; and that surely is what it was written for, that naturalists may record their own experiences, and offer their own opinions on the problems that the parasitic cuckoos set us. Until such problems are definitely solved, and proof acceptable to Science established, the humblest naturalist among us is entitled to his opinion—and the interchange of such opinions lightens the way

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for an impartial summing up of the evidence and the pronouncement of a verdict—if a verdict can indeed ever be given. But as Delight lies all along the way let as many of us as possible join in.

Mention is made on page 267 of small birds chasing cuckoos on account of their resemblance to a bird of prey—presumably the sparrow-hawk. It cannot be denied that small birds take a great interest in cuckoos and get very excited by their presence, but I do not think it is because they appear to them like a bird of prey, for reasons I have given (*vide* p. 734 of this number). It is very significant in this connection to notice that it is those species who are commonly the fosterers of the cuckoo that show the most excited interest in the cuckoo.

I do not think a cuckoo's egg has become reduced to its present small size to enable the cuckoo to carry it easily in her bill. There is as yet no evidence that she ever does so. It is generally believed that she does pick up her egg in her bill on occasions to get it into a nest, but it must not be forgotten that that has not yet been proved that she does so. I think it is due to the necessity of adapting the size of her egg to the eggs of the fosterer she has become parasitic on. As to why she should become parasitic on small birds, that is another question. Small birds are more numerous and may have offered better opportunities, bearing in mind the competition from other species of larger parasitic cuckoos on the larger species.

Not only soft-billed birds that feed on insects, but also birds of the Bunting type are made use of as fosterers. A regular fosterer in Kashmir is the Striated Meadow Bunting, and in India and Burma the Crested Bunting. These species are mostly grain and seed eaters.

Is the instance of a cuckoo rearing its own young beyond all shadow of doubt? I should much like to see the record.

With regard to the remarks on page 269, surely such Hawk Cuckoos have adapted their eggs to the fosterers they are now using. I do not quite follow that paragraph. Cuckoos we may presume laid white or non-descript eggs originally in the long, long ago, and in the case of these Hawk Cuckoos they became gradually blue for adaptation to the eggs of the species chosen by them to act as fosterers which laid blue eggs. It was certainly not a case of blue-egg-laying cuckoos going about looking for blue eggs!

As to the remarks on pages 275 and 276 a good deal has been discovered since then. I myself have taken a number of eggs of the Burmese Plaintive Cuckoo both in the Chin Hills in nests of *Suya atrogularis* (July and August), in the Shan States in nests of Franklin's Wren Warbler (*F. gracilis*) and certain tailor birds (in April, May and June). I have taken photographs of their eggs in the nests and of the young cuckoo being fed by Franklin's Wren Warbler. The adaptation to the eggs of the fosterer is remarkable, and far more perfect than I have ever seen in the case of *canorus* eggs. Here no one could doubt the mimicry or exact resemblance.

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As regards the Bay-banded cuckoo (*Penthoceryx sonneratti*) I have found it not rare in the Shan States. In my note on Cuckoos in the *Journal* of December 15, 1933, there is mention of seven eggs found in a variety of nests that I put down to this cuckoo. One of these eggs in the nest of a Shan States Scimitar Babbler has been sent to Mr. Stuart Baker for identification. It is interesting to note that these seven eggs were placed in six different species nests, and that they did not appear to be adapted to anyone of the six, as a matter of fact contrasting violently with all the fosterer's eggs. Two were found in nests of the Shan States Scimitar Babbler—the small red, richly-coloured and marked egg of the cuckoo contrasting violently with the pure white eggs of the babbler which were nearly three times as large! Of course seven eggs are not sufficient on which to form an opinion, but they do suggest that birds of many kinds will incubate anything—for none were deserted—and that fact goes against the Desertion Theory. No greater contrasts could be imagined—both in colour and size.

All seven eggs were much alike. They were marked rather like English Blackcap's eggs, but had the rich, red colouring of eggs of the Yellow-eyed Babbler (marbled and blotched type). I do not know to what species these eggs were adapted to, but the fact of seven being found in seven unsuitable nests suggests that there were none of the chosen fosterer about that locality.

With regard to cuckoos placing not more than one of their eggs in any one nest, I think, that this has only been established in the case of *canorus* and the Plaintive Cuckoo (*C. merulinus*). It does not follow that other parasitic cuckoos show a like restraint. I suspect both the Koels and Crested Cuckoos to place several of their eggs in the same nest. I have seen a pair of crows feeding three young koels sitting on a house top at Kotah, and that suggested to me at the time that a hen koel perhaps placed several of her eggs in one nest, and that the young koels that hatched out did not eliminate each other as in the case of *C. canorus*, etc. Is this so?

Experiments such as are recorded on page 280 tell against the Desertion Theory very strongly—and it has been my experience that birds will incubate anything and very rarely desert on account of a strange egg, or even object, placed in their nest. I have found only about three nests out of a hundred deserted in the case of nests with cuckoo's eggs (*C. c. bakeri*) in them, and in those three instances the reason for desertion was not established. Three per cent of desertions—or more—occur ordinarily in Nature among birds of many species due to accidents, illness, approach of cattle, or humans, etc., etc.

In this locality I have recorded how pale blue, immaculate eggs of *C. c. bakeri* are frequently placed in Stone Chat's nests where the contrast is astounding—yet I have noticed no desertions on that account.

In the above comments I apologise for certain repetitions and redundances. There is a wide and exciting field for exploration among the parasitic cuckoos in India and Burma, and for anyone

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who intends to enter in I would recommend him to read and study a small book published by Sidgwick & Jackson, 1922, *The Cuckoo's Secret* by Edgar Chance. That book gives a good idea how to set about an intensive study of the cuckoo and how it should be photographed and filmed. He proved in this way one fact among others and that was, that in England, the cuckoo actually sits on the nest of the Meadow Pipit to lay directly into the nest.

TAUNGGYI,
S. SHAN STATES, BURMA. T. R. LIVESEY.

February 11, 1936.

X.—THE BROWN SHRIKE (*LANIUS CRISTATUS* LINN.) IN BURMA AND ASSAM.

Mr. Whistler has practically answered Capt. Livesey's query about the status and plumage of the Brown Shrike (p. 307). I can add that the adult dress must be quite common in Burma as I have received, besides spring examples, five or six in the winter, all showing the black band through the eye and the underparts more or less unbarred. Some are immaculate in this respect and although most adult males show no barring, some females may also be similar. I notice that in females this band is often, but not always, less decidedly black than in males. So far as is known this Shrike does not breed in Burma, and in this connection I can state that it has not completed its full moult until early in May and that it may be commonly met with still in May or perhaps, as Capt. Livesey has noted, to early June. But then this Shrike is a late breeder and the first arrive in Kentei, Mongolia, according to Madam Koslor, on May 24. Hence its lingering on in Burma is nothing remarkable.

There is just one point I should like to query and that is that this Shrike breeds in Assam. Mr. Stuart Baker in his *Nidification of Indian Birds*, vol. ii, quotes his own records of many nests found by himself in the Cachar and Khasia Hills. But it must be noted that he quotes them 'for what they are worth', implying thereby that he is not too certain about them, in spite of the statement that birds snared off the nests are in the Bulgarian Museum. But according to the catalogue of the Royal Museum the only *Lanius cristatus* there from Cachar which might conceivably be said to have been taken in the breeding season is dated June 4, 1894 and there is nothing on the label to show that it was taken from a nest. All the others are dated from September to March. As shown above, a bird early in June might still be on passage in Cachar and beyond this there is no proof whatsoever, except Mr. Baker's recollections of forty years ago, that this Shrike breeds in Assam at all and I think we should wait further

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proof before accepting the record. After all, Cachar is some 1,600 miles south of the known southern limit of breeding!

SAXON HOUSE, APPLEDORE,
KENT, ENGLAND.
April 15, 1935.

CLAUD B. TICEHURST.

XI.—A NOTE ON THE DISTRIBUTION OF *CHLOROPSIS JERDONI* (BLYTH) AND *CHLOROPSIS A. AURIFRONS* (TEMM.) IN CENTRAL AND WESTERN BENGAL.

It seems the distribution of *Chloropsis jerdoni* (Blyth) and *C. a. aurifrons* (Temm.) in reference to Central and Lower Bengal is obscure. The *Fauna* mentions Midnapur as the easternmost limit of the range of the former, to which Mr. Whistler lends support by saying that it is 'correct' (Vernay Survey, *J.B.N.H.S.*, xxxv, 753). Jerdon writes of it as 'not extending to Lower Bengal'. Ball, however, recorded its distribution in district Burdwan (*S.F.*, vii, 215). Reports of its occurrence in 24-Perganas, Hooghly and Burdwan have from time to time reached me and on August 28, 1932, I collected one specimen ♀ from Khardah (24-Perganas). Apparently a stray or rather lonely bird though it was, there cannot be any question as to its being an 'escape' from the cage, for as a rule, females are not caught and offered for sale in the Calcutta market. I found it in a somewhat jungly waste land in the outskirts of a village: solitary and silent, clinging to low branches of *Dillenia indica* and *Alstonia scholaris* and looking for insects. Measurements: wing 90 mm., tarsus 20 mm., culmen 20 mm.

Of *C. a. aurifrons* (Temm.) the *New Fauna* has no reference to Central and Western Bengal. Blyth and Ball collected it no doubt from Midnapur. I observed it common enough at Jhargram, associating not unoften with *jerdoni* in *Sal* jungles. Jerdon also mentioned it from Midnapur as well as Lower Bengal. Cunningham (*Some Indian Friends and Acquaintances*, 93-4) who saw it in gardens near Calcutta wrote (1903): 'It is certainly seldom noticed, but this by no means implies that it is very rare, as birds of such quiet habit and singularly protective colouring may well fail to attract notice even where they are relatively common.' While one might not doubt the applicability of this remark in past days, the species is now unmistakably one of very very rare occurrence in Lower Bengal, specially in the immediate environs of Calcutta. Whatever stray specimens are now and then observed amidst remote villages may very well have been escapes from the cage (astonishingly huge trade in these birds goes on in the Calcutta market!), now at liberty, striving to hold their own against odds and adverse circumstances. They are invariably found to be shy and wandering locally. One such pair I have myself come across several times in the outskirts of village Bandipur, off Khardah (24-Perganas).

CALCUTTA.
March 4, 1936.

SATYA CHURN LAW,
M.A., PH.D., F.Z.S., M.B.O.U.

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XII.—INDUS SAND LARK (*ALAUDULA RAYTAL ADAMSI* HUME) AND CRESTED LARK (*GALERIDA CRISTATA* LINN.) LAYING IN THE SAME NEST.

Can you or any of your readers let me know if the following has ever been noticed before and if it is a regular thing?

On the 20th of this month I observed a lark's nest containing one egg and to all intents and purposes the nest was that of an Indus Sand Lark (*Alaudula adamsi*). In fact this lark was seen to rise from the locality and it was this which led to my finding the nest. The egg however appeared to be rather too large for a lark of this species; but as there was only one egg, and not wanting the bird to desert it, I did not examine it closely. I again went and examined the nest on the 23rd to obtain the full clutch and was surprised to find not two eggs but no less than five, three belonging to the Crested Lark and two to the Indus Sand Lark. The bird that flew off the nest on the second occasion was a Crested Lark (*Galerida cristata*). Now the point is, whom did the nest belong to? The size of the nest indicates that it belonged to the Indus Sand Lark as it is much smaller than that of the Crested Lark and the same size as other nests of the former in my possession. As the nest contained a full clutch of each of the birds, it shows that the nest was being shared by them and probably both helping in the matter of incubation.

GENERAL POST OFFICE,
KARACHI.
March 23, 1936.

H. M. S. NEWTON.
Postmaster.

[There are instances in which an unusual number of eggs found in a nest is the product of more than one parent of the same species. There are again instances of birds laying their eggs in the disused nests of other species, not only habitual parasites such as the cuckoos, but species which customarily build nests for themselves. The appropriation of the nest of other species occurs quite commonly among certain birds, which build nests of their own. White-throated Munias may for example not only build their nests in the base of an eagle's nest or in the nest of a Scavenger Vulture, but they frequently appropriate the disused nests of Weaver birds. Marshall even found a sparrow's nest occupied by a pair of munias. The nest contained four sparrow's eggs and seven eggs of the munias. So far as we are aware no such instances have been recorded of larks. Indus Sand Larks, from the experience of Col. A. E. Butler, and Mr. R. C. Pitman, sometimes build a nest very similar to the nest of the Crested Lark and in the present case the Crested Lark may have appropriated the nest of the former. The writer of the note had the opportunity of discovering whether the fortuitous partnership between the two species extended to the incubation of the eggs or even the care of the young.—EDS.]

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XIII.—THE BROWN WOOD OWL (*STRIX INDRANEE* SYKES).

(*With a photo*).

I see the note of this fine owl is queried in vol. xxxviii, No. 2, p. 233.

A pair of these owls which I secured at Sintaung, 12 miles south of Taunggyi, S. Shan States, in 1933 were kept in captivity



THE BROWN WOOD OWL
Young male bird.

by me for some time, and subsequently by Mr. Carrot at Maymyo for nearly two years. They have been described as a new subspecies by Mr. Stuart Baker, *Strix indranee shanensis*, in Bulletin No. cccxc of the *B.O.U.* of November 13, 1935.

I have good reason to remember the diabolical, screaming shrieks both birds (an old hen bird and a young male bird) used to utter during the night, for they were in a cage just by my bedside! They are most certainly 'Devil birds' of a kind—and their scream like the high-pitched shriek of some demented person casting themselves over a precipice! Besides this diabolical screaming they have a respectable, and lovely-sounding, rolling hoot which reminds me of the hooting of the Tawny Owl in England but, I think, it is more musical and prolonged.

The Taungyos and Taungthus name this owl from its hooting. The former call it 'Tit-ter-roo' and the latter 'Tit-til-loo'.

I had to keep them in captivity as the old female had her wing broken by a blow from a stick as she flapped out of a cave and the young bird when captured was not fully fledged and could not fly.

It is interesting to record that the eyes of the young owl were seriously injured—temporarily—by my placing it in the sunlight to photograph it. Two or three days after the photograph was

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taken the eyes turned dull red, and this bird could not see. It appeared to me that the diaphragms of the iris had opened right out, and that the back of the retina, highly inflamed, was therefore fully visible and so gave the eyes their red appearance.

It did not recover its sight for about a fortnight—the iris gradually relaxing from day to day. I have heard these owls hoot from the crags at Taunggyi. Here they apparently breed in February and March, I am told, in rocky caves. I have not heard of them under 4,000 ft.

TAUNGGYI,
S. SHAN STATES, BURMA. T. R. LIVESEY.
March 4, 1936.

XIV.—THE WHITE-BELLIED SEA-EAGLE (*HALIAEETUS LEUCOGASTER* GMELIN) IN NORTH GUJARAT.

Does the *Haliaëtus leucogaster* frequent inland lakes?

On the 9th of February 1936, I visited Gobhlaj—one of the largest artificial lakes of North Gujarat, nearly eight miles in circumference, eighteen miles south of Ahmedabad and a favourite haunt of migratory birds to pass the winter. There I saw a bird, bigger than a kite—to quote from the notes I made on the spot—'perched on a vertical post in water; its wings ashy black, top of head, neck, lower parts and legs snowy-white, beak black.' Clearly a White-Bellied Sea-Eagle.

It was not possible to see the colour of its back as the bird sat facing me at a distance of about a hundred feet. Thus I had ample opportunity to observe it with naked eye as well as with a pair of powerful binoculars. Hence there was very little chance of any mistake.

But experts say that this species of Eagle is not seen inland. It is also not recorded in the works of Butler and Barnes as occurring in Gujarat. Eha also is of opinion that it does not go inland owing to the absence of its food, viz., sea-snakes, though Stuart Baker (*Fauna of British India*, 2nd ed.) gives 'fish' as its normal food. The nearest seacoast is 50 miles from this place.

Was I mistaken? Or was the bird a straggler?

AHMEDABAD,
N. GUJERAT. HARI NARAYAN G. ACHARYA,
March 3, 1936. F.Z.S., F.R.G.S.

XV.—THE EYESIGHT OF VULTURES.

As soon as the early morning sun has taken effect vultures leave their perch and with a flapping flight of some fifteen seconds' duration, in order to get clearance, they begin to soar in circles: making height at every turn. Between five and six minutes' time they pass out of vision to the naked eye, but can be followed to greater heights with a glass until they again disappear. During

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the day the whole of India from Bombay to Calcutta is under observation by vultures and every vulture is in sight of one, or more, other vultures. When an animal has been killed the first bird to arrive is the crow. This is shortly followed by the kite. The vulture within whose orbit this takes place descends to inspect, and if the kill is worthy of his attention he makes a second descent to earth. His preliminary descent has been observed by some five or six vultures from their orbits. These converge on the vacant orbit, still keeping their altitude, and on arriving over the kill, and thus able to inspect, they, in their turn descend. The movements of each of these five or six vultures has been observed by five or six more vultures from their orbits, and the same procedure is adopted until the sky over a wide area has been drained of its vultures.

IVYBANK, BISHOPMILL,
ELGIN, N.B.
April 10, 1936.

A. A. DUNBAR BRANDER.

XVI.—A NOTE ON THE ALPINE SWIFTS (*MICROPUS MELBA BAKERI* HARTERT) AT GERSOPPA.

In a recent issue of the *Journal*, Mr. Hugh Whistler summarised our knowledge of this bird. As a considerable amount of speculation and uncertainty seems to be attached both to the records and their interpretation, I venture to place on record a few notes that I was recently able to make.

Motoring in from a camp in Dharwar, we reached the British side of the Falls at 11 a.m. on Christmas morning. The 800 ft. valley was full of Alpine swifts. They were as thick as a swarm of midges, and in this place of huge distances they looked hardly any bigger. A few flew higher and passed leisurely within a few feet of us as we stood at the top.

The ledge that overlooks the 'Rajah' is an excellent place for observation. Birds flew in and out of the innumerable cracks near the top of the cliff between the 'Rajah' and the 'Roarer'. The broader ledges are occupied by pigeons, which look like grey flies in the distance. As these birds fly about they dislodge pieces of the dry stunted grass that grows among the rocks. The swifts can then be seen chasing the straw as it floats slowly down, and having captured it carry it into crevices in the rock.

By 3 p.m. the number of birds had dwindled appreciably, but they were in all probability resting in the rocks. At dusk they had regained their numbers, and now they flew higher and even strayed some distance from the falls. Large flocks flew round twittering the while. The movement was not unlike the oft-described 'balling' of *Micropus affinis*, but was less compact. Long after dark, in fact I noted it till 10 p.m., an occasional twitter could be heard far above. Are stray birds still aloft, or is it some sort of bat?

Davidson (Birds of North Kanara, *J.B.N.H.S.*, xi & xii) believed that they collected here from the surrounding country to

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roost, and states that the birds 'pour in long after dark'. While visibility lasted (there was no moon), I noticed no movements that could be interpreted as a daily mass migration.

On the morning of the 26th we went down to the pool at the bottom, and collected a pair of swifts as they swept past us in the valley. Many birds appeared to have paired off, and some sort of aerial courting was going on. Alpine swifts in pairs were also seen elsewhere in Dharwar and Belgaum during the week.

The specimens collected, were submitted to Mr. Whistler who has named them as *bakeri*, and measures them as follows:—

♂ bill 15·5; wing 204; tail 75 mm.
♀ bill 15·5; wing 200; tail 76 mm.

The male, with fairly large salivary glands had testes measuring 18×8 mm. The female with a shelled egg in the oviduct, had the salivary glands very much more enlarged. The egg, broken by the shot, was roughly measured as 24 mm. long, which approximates to the egg obtained by Miss Cockburn, and upon which doubt has been cast. Another follicle was enlarged to a sphere of 13 mm. Two more of the ova measured 4 mm. each. The oviduct was much distended and may have been used. Both birds were very fat. The contents of the stomachs were few and unrecognizable.

There were few other birds about—the rock scarp being bare and uninviting. Pigeons, of course, were fairly numerous, and nested on the broader ledges. A honey-buzzard hung about the place, and the swifts flew excitedly round it. An unidentified hawk, in spite of being mobbed by the pigeons dropped on to a ledge and calmly flew away with a squab. On the cliff opposite the falls, white patches advertised the nests of a few pairs of *Gyps indicus*. A small number of *Krimnochelidon concolor*, *Hirundo fluvicola* (?), and a solitary *Halcyon pileata* completes the list.

This last bird was a surprise. I had always believed that it was a littoral species. The stream flows into the sea 20 miles away, and the bird probably found its way upstream. It is of interest to note that Davidson saw it in the same place many years ago.

BOMBAY. HUMAYUN ABDULALI.
March 15, 1936.

XVII.—DOES THE JAPANESE GREY QUAIL (*COTURNIX C. JAPONICA* TEMM. & SCHLEG.) BREED IN THE SHAN STATES?

Last year when ploughing in wheat seed on fallow land by my house at Taunggyi, S. Shan States, Burma, at an elevation of approximately 5,000 ft. a carefully made Quail's nest was upset, and three out of seven of the eggs destroyed. The remaining four eggs are of the Grey Quail type spotted and well marked and measured as follows:—

29.0 × 23.0 mm.; 28.0 × 22.0 mm.;
29.0 × 22.0 mm.; 29.3 × 22.5 mm.

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These measurements partly exceed the maximum width measurements given in *Nidification* for *C. c. coromandelica* and would suggest that they are eggs of the Japanese Grey Quail (*C. c. japonica*) which is not known to breed in Burma.

The nest was found on October 30, 1935, and, of course, at that time of the year the Japanese Grey Quail are with us here in the Shan States—and a casual clutch of eggs would not be too surprising. Mr. Stuart Baker saw one of the eggs and considered it to be an egg of *C. c. coromandelica* but he did not remark on its large size for that species.

I myself believe the eggs to be those of *C. c. japonica*, but the identification cannot be considered as established!

TAUNGGYI,
S. SHAN STATES, BURMA. T. R. LIVESEY.
November 5, 1935.

XVIII.—SARUS FLOCKS.

It is a well known habit of the Sarus Crane (*A. antigone*) to generally move in pairs. Taking their stand on this fact, many ornithologists aver that these birds never occur in flocks. Even that wonderful observer Devar subscribes to this opinion in his *Common Birds* (vol. ii, p. 40), though, very shrewdly, with some reservation.

This may be true for other parts of India but clearly is not correct for North Gujarat. For here, one comes across numerous flocks of this beautiful bird—sometimes peacefully resting or passing the night in an open field or on the banks of the river Sabarmati, occasionally feeding on Gram (*Cicer arietinum*) crops or sonorously flying overhead—their number varying from 20 to 200.

This flocking habit of the Sarus is peculiar for this part of the country, as it has been even observed by writers, two or three centuries back, in Samskrta literature.

AHMEDABAD, HARI NARAYAN G. ACHARYA,
N. GUJARAT. F.Z.S., F.R.G.S.
March 3, 1936.

XIX.—THE LONG-TAILED DUCK (*CLANGULA HYEMALIS* LINN.) IN SIND.

A female of the Long-tailed Duck (*Clangula hyemalis*) was shot by Mr. Lambrick at Drig, Sind, and sent to the Society for identification. This is the third record of the occurrence of this duck within Indian limits within the last few years.

The first record was of a specimen shot at Chaman, Baluchistan, in October 1933 by Capt. A. E. Dredge (Stuart Baker, *J.B.N.H.S.*, vol. xxxvii, p. 549). The second record was made by Mr. R. E. Parsons. This specimen was shot at the village of Messaki, on

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the Brahmaputra River in the Passighat Division, Sadya Frontier, Assam.

BOMBAY NATURAL HISTORY SOCIETY,
6, APOLLO STREET, BOMBAY.

S. H. PRATER.

March 15, 1936.

XX.—DEATH OF SURVEY KHALASSI DUE TO POISONING BY A COMMON KRAIT (*BUNGARUS CAERULEUS*).

Capt. H. W. Wright, R.E., has sent the following report on the death of a Survey Khalassi from Krait poisoning. The snake responsible for the fatality was submitted for identification by the Director, Geodesic Branch Survey of India. It has been identified as a Common Krait (*Bungarus caeruleus*).

'Khalassi Nandan Singh who was working in Surveyor Kundan Singh's squad died on 20th November 1935 morning at Chaman village (Jaisalmer) in map sheet 45A.

He was sleeping on the ground when at about 2-30 a.m. he found something crawling over his legs. He woke up, other khalassis in the tent who found nearby a black snake with white rings, being 1 in. in girth and 1½ ft. long, which they killed.

After an hour, Nandan Singh complained of a burning sensation in his mouth at which the Surveyor thought that the snake had bitten him. But no mark of the bite was found anywhere and neither did the deceased complain of any burning sensation over any other part of his body.

The surveyor then called the villagers to find out whether they could cure him with country-medicines, but they told him that such a snake's poison was incurable.

Within half an hour the victim died.

On receipt of the information, a Survey Officer, who was camping about four miles way from Chaman, went to look at the deceased after about six hours, by which time the body had become cold and stiff. The Officer could not discover any snake-bite mark on the body.

The local people say that it is a very poisonous snake which never bites and which after inhaling the breath that comes out through the mouth of persons who sleep with mouths open at night drops some of its poison into that person's mouth; result being instantaneous death without any remedy. Other villagers also confirm this story with many similar instances of death.'[1]

EDITORS.

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[1] That Kraits and Phoorsas poison people when asleep in the ingenious manner described above or even by merely breathing upon them is a belief prevalent in many parts of India. It is a belief akin to that of the Mythical 'Bis-Cobra' which is supposed to kill a man by casting its shadow over him!—EDS.

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XXI. MIGRATION OF WILDFOWL.

(*Continued from Volume XXXVIII, p. 627*)

Since the publication of the last list of recoveries of ringed Birds the following recoveries have been reported to us.

Place of Ringing	No.	Date	Species	Ringed by	Date of recovery	Locality	Remarks
Manchar Lake, Larkana District, Sind.	'3373	23—1—29	Widgeon, ♀ (*Mareca penelope*).	R. B. Maclachlan.	Beginning of April 1929.	6 Kilometers from Kara-Uzen, Tashkent Rly.	
Do.	3354	23—1—29	Gadwal, ♀ *C. streperus*.	Do.	9—VIII—31	Region of Ustynissk near village of Kotchardyssk, 54°25′N—60°E.	

EDITORS.

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XXII.—OCCURRENCE OF SHRENK'S BITTERN (*IXOBRYCHUS EURYTHMUS*, SWINHOE) IN AMHERST DISTRICT, TENASSERIM.

While trying to find snipe in the heavily-flooded area near Yedwingon on the Moulmein-Kyaikmaraw road on 24th September 1935 I shot an unknown *bytaing* which none of the local villagers had ever seen before.

On examination by Dr. Ticehurst, M.B.O.U., this has been identified as Shrenk's Bittern (*Ixobrychus eurythmus*) a bird which has apparently never previously been recorded within Indian limits and I have been unable to trace any Yunnan records. On the following day the same party secured a second specimen which the local coolies regrettably plucked, no others were seen.

RANGOON. C. E. MILNER,
April 4, 1936. I.F.S.

[Shrenk's Bittern is a new addition to the *Indian Avifauna*. The recorded distribution of the species is Eastern China extending into Japan. A few descend into Indo-China.—EDS.]

XXIII.—OCCURRENCE OF THE BUTTERFLY (*P. ANTIPHATES NAIRA*) IN THE NILGIRIS.

With reference to the last para of Mr. J. A. Yates' article on Butterflies of the Nilgiri District published in Part II, vol. xxxviii, of the *Journal*, I have two specimens of *P. antiphates naira* which I took on the Nadghani Ghat Road on the western slope of the Nilgiris at an elevation of about 1,500 ft. on 23rd April 1921. This is the only occasion I ever saw one.

STONE HOUSE, PEWSEY, T. DELVES BROUGHTON,
WILTS, ENGLAND. *Brigadier*, R.E. (retd.).
January 27, 1936.

XXIV.—DISTRIBUTION OF THE BUPRESTID BEETLE (*STERNOCERA CHRYSIS* F.).

Reference: *Journal of the Bombay Natural History Society*, vol. xxxviii, p. 411, *Sternocera chrysis*.

According to Obenberger's *Coleopterorum Catalogus, Buprestidae*, 1926, *Sternocera chrysis* F. is known from Ceylon, India, Baluchistan, Himalayas, Burma, Siam and South China.

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I have observed beetles of the form *chrysidoidès* feeding on the foliage of *Acacia arabica* and *A. leucophloea*. From its distribution and the habits of its allies it is probable that *S. chrysis* is associated with Acacias and breeds in stumps and roots of these trees in the larval stage.

NEW FOREST,
DEHRA DUN.
February 12, 1936.

C. F. C. BEESON,
D.SC., F.R.E.S., F.N.I.S.,
Forest Entomologist.

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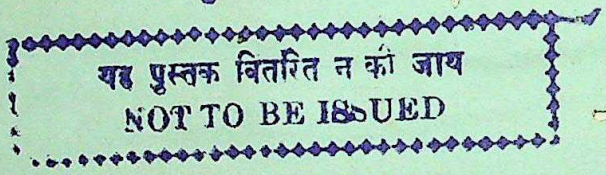
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